



# **Service and Technical Reference Guide**

HP Workstation xw3100

Second Edition

Document Part Number: 338611-001

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# Installing the Operating System

Depending on the model, Microsoft Windows 2000 Professional or Windows XP Professional is preinstalled on the workstation and will be configured automatically the first time the workstation is turned on.



**CAUTION:** Do not add optional hardware devices to your workstation until the operating system is successfully installed. Doing so may cause errors and may prevent the operating system from installing properly.



**CAUTION:** Once the automatic installation has begun, DO NOT TURN OFF THE WORKSTATION UNTIL THE PROCESS IS COMPLETE. Turning off the workstation during the installation process might damage the software that runs the workstation.

The first time the workstation is turned on, the operating system is automatically installed. This takes approximately 10 minutes, depending on the system hardware configuration. At the beginning of the installation process, you may be prompted to select the appropriate language for the operating system. Read and follow the instructions that appear on the screen to complete the installation. During this process, do not turn off your workstation unless you are directed to do so.

## 1.1 Installing or Upgrading Device Drivers

To install hardware devices such as a printer, a display adapter, or network adapter after the operating system installation is completed, the operating system needs access to the appropriate software drivers for the devices.

The I386 directory and its subdirectories provide the HP- or Compaq-specific integration of the operating system for the workstation model and include device drivers supported by Windows 2000.

When prompted for the I386 directory on the operating system CD, replace the path specification with C:\I386 or use the browse button of the dialog box to browse the system for the I386 folder.

## 1.2 Creating an Emergency Repair Diskette

### 1.2.1 Windows 2000

1. Click **Start > Programs > Accessories > System Tools > Backup**.
2. Select the menu option **Tools**, then select **Create an Emergency Disk**.
3. Follow the instructions that appear on the screen.

## **1.3 Using the Emergency Repair Diskette**

### **1.3.1 Windows 2000**

1. Insert the diskette into the diskette drive and restart the workstation (on some models you may boot to the Windows 2000 CD).
2. Press Enter to start the repair process, then choose to repair the system.
3. Select the Emergency Repair Process.
4. Follow the instructions that appear on the screen.

## **1.4 Converting to NTFS**

### **1.4.1 Windows 2000**

To convert an existing partition from a FAT 32 partition to an NTFS partition, double-click the NTFS Convert icon on the desktop. Carefully read and follow the directions that appear on the screen.

### **1.4.2 Windows XP Professional**

The Windows XP Professional operating systems handle only NTFS-formatted drives. When installed, XP will, if necessary, automatically convert a FAT32 drive to NTFS.

## **1.5 HP Software**

The Microsoft Windows 2000 Professional or Windows XP Professional operating system is preinstalled on the workstation and will be configured automatically the first time the workstation is turned on. The following HP software will also be installed at that time on selected models:

- Computer Setup Utilities and diagnostic features
- HP Support Software including device drivers
- Configuration Record
- *Online Safety & Comfort Guide*
- Enhanced HP Insight Personal Edition (Diagnostics for Windows)
- DMI Support
- Power Management with energy saver features
- Security Management tools
- Software Support Management tools



Certain drivers and utilities are available only in selected languages. You can obtain the latest version of these files, in English and selected other languages, in one of three ways:

- *Support Software CD*
- HP web site at [www.hp.com](http://www.hp.com)
- *Restore Plus! CD*, supplied with many models



Additional HP software may be required in certain situations.

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# Computer Setup Utilities and Diagnostic Features

Computer Setup Utilities (F10) and diagnostic features provide information needed about the workstation when contacting Customer Support. These tools can also be used to:

- Change factory default settings and to set or change the system configuration, which may be necessary when you add or remove hardware.
- Determine if all of the devices installed on the workstation are recognized by the system and functioning properly.
- Determine information about the operating environment of the workstation.
- Solve system configuration errors detected but not automatically fixed during the Power-On Self-Test (POST).
- Establish and manage passwords and other security features.
- Establish and manage energy-saving timeouts.



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All features identified in this chapter may not be available on all HP products.

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## 2.1 Power-On Self-Test (POST)

POST is a series of diagnostic tests that runs automatically when the system is turned on. POST checks the following items to ensure that the workstation is functioning properly:

- Keyboard
- Memory modules
- Diskette drives
- All IDE mass storage devices
- Processors
- Controllers



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If the Power-On Password is set, a key icon appears on the screen while POST is running. You will need to enter the password before continuing. Refer to Chapter 3, Section [3.1](#) for information on setting, deleting, or bypassing the password.

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If POST finds an error in the system, an audible and/or visual message occurs. For POST error messages and their solutions refer to [Appendix C, “POST Error Messages.”](#)

## 2.2 Computer Setup Utilities

Use Computer Setup Utilities (F10) to:

- Modify or restore factory default settings.
- Set the system date and time.
- Set, view, change, or verify the system configuration including settings for processor, graphics, memory, audio, storage, communications, and input devices.
- Modify the boot order of bootable devices such as hard drives, diskette drives, optical drives, or LS-120 drives.
- Configure the boot priority of IDE (ATA) hard drive controllers.
- Enable Quick Boot which is faster than Full Boot but does not run all of the diagnostic tests run during a Full Boot. You can set your system to:
  - ☐ always Quick Boot (default);
  - ☐ periodically Full Boot (from every 1 to 30 days); or
  - ☐ always Full Boot.
- Enable or disable Network Server Mode, which allows the workstation to boot the operating system when the power-on password is enabled with or without a keyboard or mouse attached. When attached to the system, the keyboard and mouse remain locked until the power-on password is entered.
- Select POST Messages Enabled or Disabled to change the display status of Power-On Self-Test (POST) messages. POST Messages Disabled suppresses most POST messages, such as memory count, product name, and other non-error text messages. If a POST error occurs, the error is displayed regardless of the mode selected. To manually switch to POST Messages Enabled during POST, press any key (except **F1** through **F12**).
- Establish an Ownership Tag, the text of which is displayed each time the system is turned on or restarted.
- Enter the Asset Tag or property identification number assigned by your company to this workstation.
- Enable power-on password prompting during system restarts (warm boots) as well as during power-on.
- Establish a setup password that controls access to Computer Setup (F10) Utility and the settings described in this section.
- Secure the integrated I/O functionality, including the serial, USB, or parallel ports, audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable Master Boot Record (MBR) Security.
- Enable or disable removable media boot ability.
- Enable or disable removable media write ability (when supported by hardware).
- Solve system configuration errors detected but not automatically fixed during the Power-On Self-Test (POST).
- Replicate your system setup by saving system configuration information on diskette and restoring it on one or more workstations.
- Execute self-tests on a specified IDE (ATA) hard drive (when supported by the drive).

## 2.2.1 Using Computer Setup (F10) Utilities

Computer Setup can be accessed only by turning on the workstation or restarting the system. To access the Computer Setup Utilities menu, complete the following steps:

1. Turn on or restart the workstation. If you are in Windows, click **Start >Shut Down >Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green.



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If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

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3. Select your language from the list and press the **Enter** key.
4. A choice of four headings appears in the Computer Setup Utilities menu: File, Storage, Security, and Advanced.
5. Use the arrow (left and right) keys to select the appropriate heading. Use the arrow (up and down) keys to select the option you want, then press **Enter**. To return to the Computer Setup Utilities menu, press **Esc**.
6. To apply and save changes, select **File > Save Changes and Exit**.
  - ☐ If you have made changes that you do not want applied, select **Ignore Changes and Exit**.
  - ☐ To reset to factory settings, select **Set Defaults and Exit**. This option will restore the original factory system defaults.






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**CAUTION:** Do NOT turn the workstation power OFF while the ROM is saving your F10 Computer Setup changes because the CMOS could become corrupted. It is safe to turn off all power to the workstation after you exit the F10 Setup screen.

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## 2.2.2 Computer Setup Menu






Heading	Option	Description											
File	System Information	Lists product name, processor type/speed/stepping, cache size (L1/L2), system ROM family and version, installed memory size, chassis serial number, integrated MAC for enabled or embedded NIC (if applicable), and asset tracking number.											
	About	Displays copyright information.											
	Set Time and Date	Allows you to set system time and date.											
	Save to Diskette	Saves system configuration, including CMOS, to a formatted blank 1.44-MB diskette in file CPQsetup.txt. Save/Restore for DiskOnKey is supported.											
	Restore from Diskette	Restores system configuration from a diskette. Save/Restore for DiskOnKey is supported.											
	Set Defaults and Exit	Restores factory default settings which includes clearing any established passwords.											
	Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.											
	Save Changes and Exit	Saves changes to system configuration and exits Computer Setup.											
Storage	Device Configuration	Lists all installed non-SCSI storage devices. When a device is selected, detailed information and options are displayed. The following options may be presented:											
		<b>Diskette Type</b> <i>(For legacy diskette drives only)</i> Identifies the highest capacity media type accepted by the diskette drive. Options are 3.5" 1.44 MB and 5.25" 1.2 MB.											
		<b>Drive Emulation</b> <i>(IDE devices only)</i> Allows you to select a drive emulation type for a storage device. (For example, a Zip drive can be made bootable by selecting disk emulation.)											
		<table><tr><th>Drive Type</th><th>Emulation Options</th></tr><tr><td rowspan="2">ATAPI Zip drive</td><td>None (treated as Other).</td></tr><tr><td>Diskette (treated as diskette drive).</td></tr><tr><td>IDE Hard disk</td><td>None (treated as Other) Disk (treated as hard drive).</td></tr><tr><td>Legacy diskette</td><td>No emulation options available.</td></tr><tr><td>IDE CD-ROM</td><td>No emulation options available.</td></tr></table>	Drive Type	Emulation Options	ATAPI Zip drive	None (treated as Other).	Diskette (treated as diskette drive).	IDE Hard disk	None (treated as Other) Disk (treated as hard drive).	Legacy diskette	No emulation options available.	IDE CD-ROM	No emulation options available.
		Drive Type	Emulation Options										
		ATAPI Zip drive	None (treated as Other).										
			Diskette (treated as diskette drive).										
		IDE Hard disk	None (treated as Other) Disk (treated as hard drive).										
		Legacy diskette	No emulation options available.										
		IDE CD-ROM	No emulation options available.										
Storage (continued)	Device Configuration (continued)	<table><tr><th>Drive Type (continued)</th><th>Emulation Options (continued)</th></tr><tr><td>ATAPI LS-120</td><td>None (treated as Other).</td></tr></table>	Drive Type (continued)	Emulation Options (continued)	ATAPI LS-120	None (treated as Other).							
Drive Type (continued)	Emulation Options (continued)												
ATAPI LS-120	None (treated as Other).												

Heading	Option	Description
		Diskette (treated as diskette drive).
		<b>Transfer Mode</b> ( <i>IDE devices only</i> ) Specifies the active data transfer mode. Options (subject to device capabilities) are PIO 0, Max PIO, Enhanced DMA, Ultra DMA 0, and Max UDMA.
		<b>Translation Mode</b> ( <i>IDE disks only</i> ) Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of Unix (e.g., SCO Unix version 3.2). Options are Bit-Shift, LBA Assisted, User, and None.  Ordinarily, the translation mode selected automatically by the BIOS should not be changed. If the selected translation mode is not compatible with the translation mode that was active when the disk was partitioned and formatted, the data on the disk will be inaccessible.
		<b>Translation Parameters</b> ( <i>IDE disks only</i> ) Allows you to specify the parameters (logical cylinders, heads, and sectors per track) used by the BIOS to translate disk I/O requests (from the operating system or an application) into terms the hard drive can accept. Logical cylinders may not exceed 1024. The number of heads may not exceed 256. The number of sectors per track may not exceed 63. These fields are only visible and changeable when the drive translation mode is set to User.
		<b>Multisector Transfers</b> ( <i>IDE disks only</i> ) Specifies how many sectors are transferred per multi-sector PIO operation. Options (subject to device capabilities) are Disabled, 8, and 16.
	Options	<b>Removable Media Boot</b> Enables/disables ability to boot the system from removable media. <b>Removable Media Write</b> Enables/disables ability to write data to removable media.  This feature applies only to legacy diskette, (IDE/ATA) LS-120 Superdisk, (IDE/ATA) LS-240 Superdisk, and (IDE/ATA) PD-optical drives.  After saving changes to Removable Media Boot, the workstation will restart. Manually, turn the workstation off, then on.
		<b>Primary IDE Controller *</b> Allows you to enable or disable the primary IDE/ATA controller.
*Option supported on select models.		
Storage (continued)	Options (continued)	<b>Secondary IDE Controller *</b> Allows you to enable or disable the secondary IDE/ATA controller.

Heading	Option	Description
		<b>Diskette MBR Validation *</b> Allows you to enable or disable strict validation of the diskette Master Boot Record (MBR).  If you use a bootable diskette image that you know to be valid, and it does not boot with Diskette MBR Validation enabled, you may need to disable this option in order to use the diskette.
		<b>BIOS IDE DMA Transfers</b> Allows you to control how BIOS disk I/O requests are serviced. When "Enable" is selected, the BIOS will service all disk I/O requests with DMA data transfers. When "Disable" is selected, the BIOS will service all disk I/O requests with PIO data transfers.
		<b>SATA Configuration *</b> Allows you to choose how the SATA controller and devices are accessed by the operating system. "Add as a Separate Controller" is the default option. Up to 4 PATA and 2 SATA devices may be accessed in this mode. The SATA and PATA controllers appear as two separate IDE controllers. Use this option with Win 2K and Win XP. <ul style="list-style-type: none"> <li>• SATA 0 is seen as SATA Primary Device 0</li> <li>• SATA 1 (if present) is seen as SATA Secondary Device 0</li> </ul> "Replace Primary IDE Controller" is the other option. Up to 2 PATA and 2 SATA devices may be accessed in this mode. The SATA and PATA controllers appear as one combined IDE controller. Use this option with Win 98 and earlier operating systems. <ul style="list-style-type: none"> <li>• SATA 0 replaces PATA Primary Device 0</li> <li>• SATA 1 replaces PATA Primary Device 1</li> </ul>
	IDE DPS Self-Test	Allows you to execute self-tests on IDE hard drives capable of performing the Drive Protection System (DPS) self-tests.  This selection will only appear when at least one drive capable of performing the IDE DPS self-tests is attached to the system.
	Controller Order	Allows you to specify the order of the attached hard drive controllers. The first hard drive controller in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached).



Heading	Option	Description
Storage (continued)	Boot Order	<p>Allows you to specify the order in which attached peripheral devices (such as a diskette drive, hard drive, optical drive, or network interface card) are checked for bootable operating system image. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source.</p> <p> MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.</p> <p><b>Shortcut to Temporarily Override Boot Order</b></p> <p>To boot <b>one time</b> from a device other than the default device specified in Boot Order, restart the workstation and press <b>F9</b> when the <b>F10=Setup</b> message appears on the screen. After POST is completed, a list of bootable devices is displayed. Use the arrow keys to select the preferred bootable device and press <b>Enter</b>. The workstation then boots from the selected non-default device for this one time.</p>
	Setup Password	<p>Allows you to set and enables setup (administrator) password.</p> <p> If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.</p> <p>See the <i>Troubleshooting Guide</i> for more information.</p>
	Power-On Password	Allows you to set and enable power-on password.
	Password Options (This selection will appear only if a power-on password is set.)	Allows you to specify whether the password is required for warm boot ( <b>CTRL+ALT+DEL</b> ).
	Smart Cover	<p>Allows you to enable/disable Smart Cover Lock.</p> <p> <i>Notify User</i> alerts the user that the sensor has detected that the cover has been removed. <i>Setup Password</i> requires that the setup password be entered to boot the workstation if the sensor detects that the cover has been removed.</p> <p>This feature is supported on select models only.</p>
	Smart Sensor	<p>Allows you to:</p> <p>Enable/disable the Smart Sensor.</p> <p> <i>Notify User</i> alerts the user that the sensor has detected that the cover has been removed. <i>Setup Password</i> requires that the setup password be entered to boot the workstation if the sensor detects that the cover has been removed.</p> <p>This feature is supported on select models only.</p>
*Option supported on select models.		

Heading	Option	Description
Security (continued)	DriveLock*	<p>Allows you to assign or modify a master or user password for select IDE hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.</p> <p> This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.</p> <p>This feature is supported on select models only.</p>
	Master Boot Record Security*	<p>Allows you to enable or disable Master Boot Record (MBR) Security.</p> <p>When enabled, the BIOS rejects all requests to write to the MBR on the current bootable disk. Each time the workstation is powered on or rebooted, the BIOS compares the MBR of the bootable disk to the previously saved MBR. If changes are detected, you are given the option of saving the MBR on the current bootable disk, restoring the previously-saved MBR, or disabling MBR security. You must know the setup password if one is set.</p> <p> Disable MBR Security before intentionally changing the formatting or partitioning of the current bootable disk. Several disk utilities (such as FDISK and FORMAT) attempt to update the MBR. If MBR Security is enabled and disk accesses are being serviced by the BIOS, write requests to the MBR are rejected, causing the utilities to report errors. If MBR Security is enabled and disk accesses are being serviced by the operating system, any MBR change will be detected by the BIOS during the next reboot, and an MBR Security warning message will be displayed.</p>
	Save Master Boot Record*	<p>Saves a backup copy of the Master Boot Record of the current bootable disk.</p> <p> Only appears if MBR Security is enabled.</p>
	Restore Master Boot Record*	<p>Restores the backup Master Boot Record to the current bootable disk.</p> <p> Only appears if all of the following conditions are true:</p> <ul style="list-style-type: none"> <li>MBR Security is enabled.</li> <li>A backup copy of the MBR has been previously saved.</li> <li>The current bootable disk is the same disk from which the backup copy of the MBR was saved.</li> </ul> <p> Restoring a previously saved MBR after a disk utility or operating system has modified the MBR may cause the data on the disk to become inaccessible. Only restore a previously saved MBR if you are confident that the current bootable disk's MBR has been corrupted or infected with a virus.</p>

\*Option supported on select models.


Heading	Option	Description
Security (continued)	Device Security*	Enables/disables serial ports A and B, parallel port, front USB ports, all USB ports, system audio, and network controllers (some models).
	Network Service Boot	Enables/disables the workstation's ability to boot from an operating system installed on a network server. (Feature available on NIC models only; the network controller must reside on the PCI bus or be embedded on the system board.)
	System IDs	<p>Allows you to set:</p> <ul style="list-style-type: none"> <li>Asset tag (18-byte identifier) and ownership Tag (80-byte identifier displayed during POST).</li> </ul> <p>See Chapter 3, Desktop Management, in this Guide.</p> <ul style="list-style-type: none"> <li>Chassis serial number or Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.)</li> </ul> <p>Keyboard locale setting (for example, English or German) for System ID entry.</p>

\*Option supported on select models.

Heading	Option	Description
Advanced**	Power-On Options	<p>Allows you to set:</p> <p>POST mode (QuickBoot, FullBoot, or FullBoot every 1-30 days).</p> <p>POST messages (enable/disable).</p> <p>Safe POST* (enable/disable). Enabling this feature allows the ROM to monitor add-in cards during boot. If an add-in card does not work or initialize correctly, then on the next boot all cards will be skipped during POST.</p> <p><b>F9</b> prompt (enable/disable). Enabling this feature will display the text <b>F9=Boot Menu</b> during POST. Disabling this feature prevents the text from being displayed but pressing <b>F9</b> will still access the Shortcut Boot (Order) Menu screen. See <b>Storage &gt; Boot Order</b> for more information.</p> <p><b>F10</b> prompt (enable/disable). Enabling this feature will display the text <b>F10=Setup</b> during POST. Disabling this feature prevents the text from being displayed but pressing <b>F10</b> will still access the Setup screen.</p> <p><b>F12</b> prompt (enable/disable). Enabling this feature will display the text <b>F12=Network Service Boot</b> during POST. Disabling this feature prevents the text from being displayed but pressing <b>F12</b> will still force the system to attempt booting from the network.</p> <p>Option ROM* prompt (enable/disable). Enabling this feature will cause the system to display a message before loading options ROMs.</p> <p>Remote wakeup boot source (remote server/local hard drive).</p> <p>After Power Loss (off/on): After power loss, if you connect your workstation to an electric power strip and would like to turn on power to the workstation using the switch on the power strip, set this option to <b>ON</b>.</p> <p> If you turn off power to your workstation using the switch on a power strip, you will not be able to use the suspend/sleep feature or the Remote Management features.</p>
<p>* Available on select models.</p> <p>**These options should be used by advanced users only.</p>		

Heading	Option	Description
Advanced** (continued)	Power-On Options (continued)	<p>Allows you to set: (continued)</p> <p>POST Delay (in seconds) (enable/disable). Enabling this feature will add a user-specified delay to the POST process. This delay is sometimes needed for hard disks on some PCI cards that spin up very slowly; so slowly that they are not ready to boot by the time POST is finished. The POST delay also gives you more time to select <b>F10</b> to enter Computer (F10) Setup.</p> <p>I/O APIC Mode (enable/disable). Enabling this feature will allow Microsoft Windows Operating system to run optimally. This feature must be disabled for certain non-Microsoft Operating Systems to work properly.</p> <p>ACPI/USB Buffers @ Top of Memory (enable/disable). Enabling this feature places USB memory buffers at the top of memory. The advantage of remapping is that it allows space in the DOS Compatibility Hole range, below 1MB, to be made available for additional PCI plug-in cards that need option ROM space. The disadvantage is that a popular memory manager, HIMEM.SYS, does not work properly when USB buffers are at top of memory AND the system has 64 KB or less of RAM.</p> <p>NIC Option ROM Download (enable/disable). The BIOS contains an embedded NIC option ROM to allow the unit to boot through the network to a PXE server. This is typically used to download a corporate image to a hard drive. The NIC option ROM takes up memory space below 1MB commonly referred to as DOS Compatibility Hole (DCH) space. This space is limited. This F10 option will allow users to disable the downloading of this embedded NIC option ROM thus giving more DCH space for additional PCI cards which may need option ROM space. The default will be to have the NIC option ROM enabled.</p>
	Onboard Devices	Allows you to set resources for or disable onboard system devices (serial port, parallel port, or diskette controller).
	PCI Devices	<p>Lists currently installed PCI devices and their IRQ settings.</p> <p>Allows you to reconfigure IRQ settings for these devices or to disable them entirely. These settings have no effect under an APIC-based operating system.</p>

\* Available on select models.  
\*\*These options should be used by advanced users only.

Heading	Option	Description
Advanced** (continued)	Bus Options*	<p>Allows you to enable or disable:</p> <p>PCI bus mastering, which allows a PCI device to take control of the PCI bus.</p> <p>PCI VGA palette snooping, which sets the VGA palette snooping bit in PCI configuration space; only needed when more than one graphics controller is installed.</p> <p>PCI SERR# generation.</p> <p>ECC support allows hardware-based error correction for ECC-capable memories.</p>
	Device options	<p>Allows you to set:</p> <p>C1 Halt Disconnect.* Enabled by default on select models. Allows user to disconnect Front Side Bus during idle time to reduce power consumption.</p> <p>Printer mode (bi-directional, EPP+ECP, output only).</p> <p><b>Num Lock</b> state at power-on (off/on).</p> <p>PME (power management event) wakeup events (enable/disable).</p> <p>Processor cache (enable/disable).</p> <p>Hyper-Threading* (enable/disable).</p> <p>ACPI S3* support (enable/disable). S3 is an ACPI sleep state that some add-in hardware options may not support.</p> <p> If the ACPI S3 support option is not presented, the other ACPI S3 options (ACPI S3 Video REPOST, ACPI S3 Hard disk Reset, and ACPI S3 PS2 Mouse Wakeup) will not be available.</p> <p>ACPI S3 Video REPOST* (enable/disable). This feature reruns the video option ROM on a boot from the S3 state.</p> <p>ACPI S3 Hard Disk Reset* (enable/disable). Resets the hard disk on a boot from the S3 sleep state.</p> <p>ACPI S3 PS2 Mouse Wakeup* (enable/disable). Allows the mouse to wake the system from the S3 sleep state.</p> <p>AGP Aperture size* Allows you to specify the amount of system memory reserved for use by your graphics controller.</p> <p>Monitor Tracking (enable/disable). Allows ROM to save monitor asset information.</p> <p>Unique Sleep State Blink Patterns*. Allows you to choose an LED blink pattern that uniquely identifies each sleep state.</p> <p>Frame Buffer Size* Allows you to specify amount of system memory dedicated to the embedded graphics frame buffer. The AUTO setting attempts to optimize the frame buffer size depending on the amount of total system memory.</p>
	PCI VGA Configuration	<p>Displayed only if there are multiple PCI video adapters in the system. Allows you to specify which VGA controller will be the "boot" or primary VGA controller.</p>

\* Available on select models.

\*\*These options should be used by advanced users only.

## 2.3 Diagnostics for Windows

The Diagnostics for Windows (DFW) utility is a component of Intelligent Manageability that allows you to view information about the hardware and software configuration of the workstation while running Microsoft Windows (Microsoft Windows 2000 and Microsoft Windows XP). It also allows you to perform hardware and software tests on the subsystems of the workstation.

When you invoke Diagnostics for Windows, the current configuration of the workstation is shown on the Overview screen. There is access from this screen to several categories of information about the workstation and the **Test** tab. The information in every screen of the utility can be saved to a file or printed.



To test all subsystems, you must log in as the administrator. If you do not log in as the administrator, you will be unable to test some subsystems. The inability to test a subsystem will be indicated by an error message under the subsystem name in the Test window or by shaded check boxes that cannot be selected.

Use Diagnostics for Windows in the following instances to:

- Determine if all the devices installed on the workstation are recognized by the system and functioning properly. Running tests is optional but recommended after installing or connecting a new device.
- Third party devices not supported by HP may not be detected. Save, print, or display the information generated by the utility.

### 2.3.1 Detecting Diagnostics for Windows

Some workstations ship with the Diagnostics for Windows preloaded, but not preinstalled.

To determine whether Diagnostics for Windows is installed:

1. Access the location of the Diagnostics icons:
  - ☐ In Windows 2000 Professional, select **Start > Settings > Control Panel**.
  - ☐ In Windows XP Professional, select **Start > Control Panel > Performance and Maintenance**.
2. If icons for Configuration Record and Diagnostics for Windows are present, the Diagnostics for Windows utility is installed. If the icons are not present, the utility is either not preloaded or not installed.

### 2.3.2 Installing Diagnostics for Windows

If Diagnostics for Windows is not preloaded, you can download the Diagnostics for Windows SoftPaq from the following Web site:

<http://www.hp.com/support/files>

Once the software has been downloaded onto the hard drive it may be installed by performing these steps:

1. Close all Windows applications.
2. Install the Diagnostics for Windows utility:
  - ☐ In Windows XP, select **Start > Setup Software** icon. Select **Diagnostics for Windows > Next** button, then follow the instructions on the screen.

- ☐ In Windows 2000, select the **Setup Software** icon on the **Desktop > Diagnostics for Windows > Next** button, then follow the instructions on the screen.
  - ☐ In either Windows XP or Windows 2000, if the Setup Software icon is not on the Desktop or in the Start menu, run the Setup program from the **C:\CPQAPPS\DIAGS** directory or select **Start > Run** and type the following in the command line:  
**C:\CPQAPPS\DIAGS\SETUP.**
3. Click **Next** to install Diagnostics for Windows.
  4. After the program has finished installing, you may be prompted to restart the workstation, or it may automatically restart. If prompted, click **Finish** to restart the workstation or **Cancel** to exit the program. You must restart the workstation to complete the installation of Diagnostics for Windows.



If you want to upgrade an existing version of Diagnostics for Windows installed on the workstation, visit <http://www.hp.com/support/files> and click on an applicable product. Locate the desired software and download the latest version. Execute the downloaded file and select **Repair** to update the installed version. This will cause the new version to overwrite the old version.

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### 2.3.3 Using Categories in Diagnostics for Windows

To use categories:

1. Click **Start > HP Information Center > Diagnostics for Windows**. You can also select the **Diagnostics for Windows** icon, located in the Control Panel.  
The screen displays the overview of the workstation hardware and software.
  - ☐ In Windows 2000 Professional, select **Start > Settings > Control Panel**, then select **Diagnostics for Windows**.
  - ☐ In Windows XP Professional, select **Start > Control Panel > Performance and Maintenance**, then select **Diagnostics for Windows**.
2. For specific hardware and software information, select a category from the **Categories** pull-down menu or the appropriate icon on the toolbar.



As the cursor moves over the toolbar icons, the corresponding category name is displayed.

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3. To display more detailed information in a selected category, click **More** in the **Information Level** box in the lower left corner of the window or click **Level** at the top of the screen and select **More**.
4. Review, print, and/or save this information as desired.
  - ☐ To print the information, click **File > Print**. Select one of the following options: **Detailed Report (All Categories)**, **Summary Report (All Categories)**, or **Current Category**. Click **OK** to print the report you selected.
  - ☐ To save the information, click **File > Save As**. Select one of the following options: **Detailed Report (All Categories)**, **Summary Report (All Categories)**, or **Current Category**. Click **OK** to save the report you selected.
5. To exit Diagnostics for Windows, click **File**, and then click **Exit**.



## Menu Bar—File, Categories, Navigation, Level, Tab, Help

At the top of the Diagnostics for Windows screen is the Menu Bar consisting of six pull-down menus. Selecting an item will provide the following information on the system:

- File—Save As, Print, Printer Setup, Exit
- Categories
  - ☐ System—System board, ROM, date, and time
  - ☐ Asset Control—Asset tag, system serial number, and processor
  - ☐ Input Devices—Keyboard, mouse, and joystick(s)
  - ☐ Communication—Ports
  - ☐ Storage—Storage drives
  - ☐ Graphics—Graphics
  - ☐ Memory—System board and Windows memory
  - ☐ Multimedia—Optical storage (CD, DVD, and so on) and audio
  - ☐ Windows—Windows
  - ☐ Architecture—PCI Device
  - ☐ Resources—IRQ, I/O, and Memory Map
  - ☐ Health—Status of system temperature and hard drives
  - ☐ Miscellaneous—CMOS, DMI, BIOS, System, Product Name, and Serial Number
- Navigation—Previous Category (**F5**), Next Category (**F6**)
- Level—Less (**F7**), More (**F8**) <information on the screen>
- Tab
  - ☐ Overview—Displays general information about the workstation. This window is displayed when first starting the utility. The left side of the window shows hardware information, while the right side shows software information.
  - ☐ Test—Allows you to choose various parts of the system to test. You can also choose the type of test and testing mode.
  - ☐ Status—Displays the status of each test in progress. You can cancel testing by clicking the **Cancel Testing** button.
  - ☐ Log—Displays a log of tests for each device.
  - ☐ Error—Displays any errors that occurred during device testing. The window lists the device being tested, the type and number of errors, and the error code.
- Help—Contents, How to use Help, About

## 2.3.4 Running Diagnostic Tests in Diagnostics for Windows

To run diagnostic tests:

1. Click **Start > HP Information Center > Diagnostics for Windows**.

Alternately, you can access Diagnostics for Windows via the control panel.

The screen displays the overview of the workstation hardware and software. Five tabs are displayed below the row of icons: **Overview**, **Test**, **Status**, **Log**, and **Error**.

2. Click the **Test** tab, or click **Tab** at the top of the screen and select **Test**.

3. Select one of the following options:

- ☐ **Quick Test**—Runs a quick, general test on each device. Requires no user intervention if Unattended Mode is selected.
- ☐ **Complete Test**—Runs maximum testing of each device. The user can select Interactive Mode or Unattended Mode.
- ☐ **Custom Test**—Runs only the tests you select. To select specific devices or tests, find the device in the list, then select the check box beside each test. When selected, a red check mark is displayed in the box. Some tests selected may require user intervention.



To test all subsystems, you must log in as the administrator. If you do not log in as the administrator, you will be unable to test some subsystems. The inability to test a subsystem will be indicated by an error message under the subsystem name in the Test window or by shaded boxes that cannot be checked.

4. Select **Interactive Mode** or **Unattended Mode**. In Interactive Mode, the diagnostic software will prompt you for input during tests that require it. Some tests require interaction and will display errors or halt testing if selected in conjunction with Unattended Mode.

- ☐ **Interactive Mode** provides maximum control over the testing process. You determine whether the test passed or failed and may be prompted to insert or remove devices.
- ☐ **Unattended Mode** does not display prompts. If errors are found, they are displayed when testing is complete.

5. Click the **Begin Testing** button at the bottom of the window. Test Status is displayed, showing the progress and result of each test. For more details on the tests run, click the **Log** tab or click **Tab** at the top of the screen and select **Log**.

6. To view a test report, select one of three tabs:

- ☐ **Status**—Summarizes the tests run, passed, and failed during the current testing session.
- ☐ **Log**—Lists tests run on the system, the numbers of times each test has run, the number of errors found on each test, and the total run time of each test.
- ☐ **Error**—Lists all errors found on the workstation with their error codes.

7. To save a test report:

- ☐ Select the **Log** tab **Save** button to save a Log tab report.
- ☐ Select the **Error** tab **Save** button to save an Error tab report.

8. To print a test report:
  - ☐ If the report is on the Log tab, select **File > Save As**, then print the file from the selected folder.
  - ☐ If the report is on the Error tab, select the **Error** tab **Print** button.
9. If errors are found, click the **Error** tab to display more detailed information and recommended actions.
10. Click **Print** or save the error information for future reference.
11. To exit Diagnostics for Windows, click **File > Exit**.

## 2.4 Configuration Record

The Configuration Record utility is a windows-based information-gathering tool that gathers critical hardware and software information from various workstation subsystems. The information includes such things as the ROM, asset tag, processor, physical drives, PCI devices, memory, graphics, operating system version number, operating system parameters, and the operating system startup files to give a complete view of the workstation. Configuration Record provides a means for automatically identifying and comparing configuration changes, and has the ability to maintain a configuration history. The information can be saved as a history of multiple sessions.

This utility allows the resolution of problems without taking the workstation offline and assists in maximizing the workstation availability. The information obtained by the utility is useful in troubleshooting system problems, and streamlines the service process by enabling quick and easy identification of system configurations.

The utility displays its findings in a *Now.log* file. If the original *Base.log* file is present in the *cpqdiags* directory, the *Base.log* file is displayed next to the *Now.log* file in a split window with the differences between the two highlighted in the color red.

### 2.4.1 Installing Configuration Record

The Configuration Record is part of Diagnostics for Windows and is automatically installed at the same time as Diagnostics for Windows.

### 2.4.2 Running Configuration Record

To run this program:

1. Click **Start > HP Information Center > Configuration Record**.

Alternately, you can access Diagnostics for Windows via the control panel.



The Configuration Record utility has two view options: **Show Changed Items Only** and **Show All**. The default view is **Show Changed Items Only**, therefore all the text is displayed in the color red since it shows only the differences. Switching to **Show All** displays the complete, comprehensive view of the system.

2. The default view is **Show Changed Items Only**. To view all the information gathered by Configuration Record, click **View** at the top of the window and select **Show All**, or click the **Show All Items** icon.
3. To save the information in the left or right window, select **File > Save Window File** and then select **Left Window File** or **Right Window File**.



Saving the configuration of the workstation periodically allows the user to keep a history of the configuration. This history may be useful to you in the future if the system ever encounters a problem that needs debugging.

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4. To exit Configuration Record, click **File**, then click **Exit**.

## 2.5 Remote Diagnostics Enabling Agent

This utility provides a Web browser interface to Diagnostics for Windows. It enables remote control of the diagnostics and facilitates easy transfer of workstation information from remote machines to a service provider.

The Remote Diagnostics Enabling Agent captures hardware configuration and provides the ability to perform tests remotely to diagnose workstation problems. In addition, the Remote Diagnostics Enabling Agent identifies any workstation hardware device problems signaled by the HP Management Agents. These hardware devices are automatically selected for testing by the Remote Diagnostics Enabling Agent.



The Remote Diagnostics Enabling Agent only works if Diagnostics for Windows is also installed.

The Remote Diagnostics Enabling Agent is pre-loaded on some workstations and is available through a SoftPaq at <http://www.hp.com> under **Support and Drivers**.

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### 2.5.1 Installing or Upgrading Remote Diagnostics Enabling Agent

1. Visit <http://www.hp.com/support/files> and click on the applicable product.
2. Locate the appropriate software and download the latest version.
3. Execute the downloaded file. If you are upgrading an existing version, select **Repair** for the new version to overwrite the old version.

### 2.5.2 Running the Remote Diagnostics Enabling Agent

1. Select the **Remote Diagnostics** icon located in the Control Panel.



The Remote Diagnostics Enabling Agent allows you to run Diagnostic Test or the Configuration Record in a browser window. Both of these utilities can be run remotely or locally.

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2. To exit Remote Diagnostics, click **File** and then click **Close**.

## 2.6 Protecting the Software

To protect software from loss or damage, you should keep a backup copy of all system software, applications, and related files stored on the hard drive. See the operating system or backup utility documentation for instructions on making backup copies of data files.

## 2.7 Restoring the Software

The Windows operating system and software can be restored to its original state by using the *Restore CD*. See the *Restore CD* for complete instructions on using this feature.



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## Desktop Management

HP Intelligent Manageability provides standards-based solutions for managing and controlling desktops, workstations, and notebook PCs in a networked environment.

The key capabilities and features of desktop management are:

- Initial configuration and deployment
- Remote system installation
- Software updating and management
- ROM flash
- Asset tracking and security
- Fault notification and recovery



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Support for specific features described in this guide may vary by model or software version.

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### 3.1 Initial Configuration and Deployment

HP workstations come with a preinstalled system software image. After a brief software “unbundling” process, the workstation is ready to be used.

A customized software image may be deployed by:

- Installing additional software applications after unbundling the preinstalled software image.
- Using software deployment tools, such as Altiris Deployment Solutions, to replace the preinstalled software with a customized software image.
- Using a disk cloning process to copy the contents from one hard drive to another.

The best deployment method depends on your information technology environment and processes. The PC Deployment section of the Solutions and Services Web site (<http://www.hp.com/go/pcsolutions>) provides information to help you select the best deployment method.

The *Restore Plus!* CD, ROM-based setup, and ACPI hardware provide further assistance with recovery of system software, configuration management and troubleshooting, and power management.

## 3.2 Remote System Installation

Remote System Installation allows you to start and set up your system using the software and configuration information located on a network server by initiating the Preboot Execution Environment (PXE). The Remote System Installation feature is usually used as a system setup and configuration tool, and can be used for the following tasks:

- Formatting a hard drive.
- Deploying a software image on one or more new PCs.
- Remotely updating the system BIOS in flash ROM. See Section 3.3.8, “Remote ROM Flash.”
- Configuring the system BIOS settings.

To initiate Remote System Installation, press **F12** when the F12 = Network Service Boot message appears in the lower-right corner of the HP logo screen. Follow the instructions on the screen to continue the process. The default boot order is a BIOS configuration setting that can be changed to always attempt to PXE boot.

## 3.3 Software Updating and Management

HP provides several tools for managing and updating software on desktops and workstations—Altiris PC Transplant Pro; HP Client Manager Software, an Altiris solution; System Software Manager; HP Proactive Notification, and ActiveUpdate.

### 3.3.1 HP Client Manager Software

HP Client Manager Software (HP CMS) tightly integrates HP Intelligent Manageability technology within Altiris to provide superior hardware management capabilities for HP access devices that include:

- Detailed views of hardware inventory for asset management
- PC health check monitoring and diagnostics
- Proactive notification of changes in your hardware environment
- Web-accessible reporting of business critical details such as machines with thermal warnings, memory alerts, and more
- Remote updating of system software such as device drivers and ROM BIOS

For more information on the HP Client Manager, visit <http://www.hp.com/go/easydeploy>.

### 3.3.2 Altiris Solutions

HP Client Manager provides centralized hardware management of HP client devices for all IT lifecycle areas.

- Inventory and Asset Management
  - ❑ SW license compliance
  - ❑ PC tracking and reporting
  - ❑ Lease contract, fixing asset tracking



- Deployment and Migration
  - ❑ Windows 2000/XP migration
  - ❑ System deployment
  - ❑ Personality migrations
- Help Desk and Problem Resolution
  - ❑ Managing help desk tickets
  - ❑ Remote troubleshooting
  - ❑ Remote problem resolution
  - ❑ Client disaster recovery
- Software and Operations Management
  - ❑ Ongoing desktop management
  - ❑ HP system SW deployment
  - ❑ Application self-healing

On selected desktop and notebook models, an Altiris management agent is included as part of the factory loaded image. This agent enables communication with the Altiris development Solution which can be used to complete new hardware deployment or personality migration to a new OS using easy-to-follow wizards. Altiris solutions provide easy-to-use software distribution capabilities. When used in conjunction with System Software Manager (Section 3.3.4), or the HP Client Manager, administrators can also update ROM BIOS and device driver software from a central console.

For more information, visit <http://www.hp.com/go/easydeploy>

### 3.3.3 Altiris PC Transplant Pro

Altiris PC Transplant Pro allows you to preserve old settings, preferences, and data and migrate them to the new environment quickly and easily.

For more information, visit <http://www.hp.com/go/easydeploy>.

### 3.3.4 System Software Manager

System Software Manager (SSM) lets you update system-level software on multiple systems simultaneously. When executed on a PC client system, SSM detects both hardware and software versions, then updates the appropriate software from a central repository, also known as a file store. Driver versions that are supported by SSM are denoted with a special icon on the driver download Web site and on the Support Software CD. To download the utility or to obtain more information on SSM, visit <http://www.hp.com/go/ssm>.

### 3.3.5 Product Change Notification (PCN)

This feature is available on select models.

The HP Proactive Notification program uses the Subscriber's Choice Web site to proactively and automatically:

- Send you Product Change Notification (PCN) emails informing you of hardware and software changes to most workstations, up to 60 days in advance.

- Send you email containing Customer Bulletins, Customer Advisories, Customer Notes, Security Bulletins, and Driver alerts for most workstations.

You create your own profile to ensure that you only receive the information relevant to your IT environment. To learn more about HPPN and create your custom profile, visit

<http://www.hp.com/go/pcn>

### 3.3.6 ActiveUpdate

ActiveUpdate is a client-based application from HP. The ActiveUpdate client uses your user-defined profile to proactively and automatically download software updates to a server repository for most HP workstations.

To learn more about ActiveUpdate, download the application, and create your custom profile, visit <http://www.compaq.com/activeupdate>.

### 3.3.7 ROM Flash

The workstation comes with a reprogrammable flash ROM (read only memory). By establishing a setup password in Computer Setup (F10) Utility, you can protect the ROM from being unintentionally updated or overwritten. This is important to ensure the operating integrity of the workstation. Should you need or want to upgrade your ROM, you may:

- Order an upgraded *ROMPaq*™ diskette from HP.
- Download the latest ROMPaq images from <http://www.hp.com/support>.



**CAUTION:** For maximum ROM protection, be sure to establish a setup password. The setup password prevents unauthorized ROM upgrades. System Software Manager allows the system administrator to set the setup password on one or more PCs simultaneously. For more information, visit <http://www.hp.com/go/ssml>.

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### 3.3.8 Remote ROM Flash

Remote ROM Flash allows the system administrator to safely upgrade the ROM on remote HP workstations directly from the centralized network management console. Enabling the system administrator to perform this task remotely, on multiple workstations, results in a consistent deployment of and greater control over HP PC ROM images over the network.



The workstation must be powered on, or turned on through Remote Wakeup, to take advantage of Remote ROM Flash.

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For more information on Remote ROM Flash, refer to the HP Client Manager Software or System Software Manager at <http://www.hp.com/go/easydeploy>.

### 3.3.9 FailSafe Boot Block ROM

The FailSafe Boot Block ROM allows for system recovery in the unlikely event of a ROM flash failure, for example, if a power failure were to occur during a ROM upgrade. The Boot Block is a flash-protected section of the ROM that checks for a valid system ROM flash when power to the system is turned on.


- If the system ROM is valid, the system starts normally.
- If the system ROM fails the validation check, the FailSafe Boot Block ROM provides enough support to start the system from a ROMPaq diskette, which will program the system ROM with a valid image.

When the bootblock detects an invalid system ROM, The System Power LED blinks RED 8 times, one every second, followed by a 2 second pause. Also 8 simultaneous beeps will be heard. A Boot Block recovery mode message is displayed on the screen (some models).

To recover the system after it enters Boot Block recovery mode, complete the following steps:

1. If there is a diskette in the diskette drive, remove the diskette and turn off the power.
2. Insert a ROMPaq diskette into the diskette drive.
3. Turn on power to the system.
4. If no ROMPaq diskette is found, you will be prompted to insert one and restart the workstation.
5. If a setup password has been established, the Caps Lock light will turn on and you will be prompted to enter the password.
6. Enter the setup password.
7. If the system successfully starts from the diskette and successfully reprograms the ROM, then the three keyboard lights will turn on. A rising tone series of beeps also signals successful completion.
8. Remove the diskette and turn the power off.
9. Turn the power on again to restart the workstation.

The following table lists the various keyboard light combinations used by the Boot Block ROM (when a PS/2 keyboard is attached to the workstation), and explains the meaning and action associated with each combination.

<b>Keyboard Light Combinations Used by Boot Block ROM</b>			
<b>Failsafe Boot Block Mode</b>	<b>Keyboard LED Color</b>	<b>Keyboard LED Activity</b>	<b>State/Message</b>
Num Lock	Green	On	ROMPaq diskette not present, is bad, or drive not ready.
Caps Lock	Green	On	Enter password.
Num, Caps, Scroll Lock	Green	Blink on in sequence, one-at-a-time—N,C,SL	Keyboard locked in network mode.
Num, Caps, Scroll Lock	Green	On	Boot Block ROM Flash successful. Turn power off, then on to reboot.
 Diagnostic lights do not flash on USB keyboards.			

### 3.3.10 Replicating Your Setup

This procedure gives an administrator the ability to quickly and easily copy one setup configuration to other workstations of the same model. To replicate the setup:

1. Access the Computer Setup Utilities (F10) menu.
2. Click **File > Save to Diskette**. Follow the instructions on the screen.



---

This requires a diskette drive or a supported USB flash media device, such as DiskOnKey.

---

3. To replicate the configuration, click **File > Restore from Diskette**, and follow the instructions on the screen.

System Software Manager (SSM) may also be used to distribute setup configurations to multiple workstations. For more information, see <http://www.hp.com/go/ssm>.

### 3.3.11 Dual-State Power Button

With Advanced Configuration and Power Interface (ACPI) enabled for Windows 2000 and Windows XP, the power button can function either as an on/off switch or as a suspend button. The suspend feature does not completely turn off power, but instead causes the workstation to enter a low-power standby. This allows you to quickly power down without closing applications and to quickly return to the same operational state without any data loss.

To change the power button's configuration, complete the following steps:

1. In Windows 2000, left click on the **Start Button**, then select **Settings > Control Panel > Power Options**.  
In Windows XP, left click on the **Start Button**, then select **Control Panel > Performance and Maintenance > Power Options**.
2. In the **Power Options Properties**, select the **Advanced** tab.
3. In the **Power Button** section, select the desired power button setting.

After configuring the power button to function as a suspend button, press the power button to put the system in a very low power state (suspend). Press the button again to quickly bring the system out of suspend to full power status. To completely turn off all power to the system, press and hold the power button for four seconds.



---

**CAUTION:** Do not use the power button to turn off the workstation unless the system is not responding; turning off the power without operating system interaction could cause damage to or loss of data on the hard drive.

---

### 3.3.12 Energy Star

HP products purchased with the Energy Star configuration are compliant with the U.S. Environmental Protection Agency (EPA) Energy Star Computers Program. The EPA Energy Star configuration does not imply endorsement by the EPA. As an Energy Star Partner, HP has determined that products with the Energy Star configuration meet the Energy Star guidelines for energy efficiency.

The Energy Star Computers Program was created by the EPA to promote energy efficiency and reduce air pollution through more energy-efficient equipment in homes, offices, and factories. HP products achieve this by reducing the power consumption when not being used. Instructions for using the energy saving features of the workstation are located in the “Power Management” section below.

The power management feature is compatible with operating systems and environments that support APM1.2. This means that users in those environments will not be disconnected from the network during the low-power operating state.

The Power Management feature, when used in conjunction with an external Energy Star compliant monitor, will support the power-down features of the monitor. The Power Management feature allows an external monitor to go into low-power mode when the energy save timeout occurs.



**CAUTION:** Using the Energy Save Monitor feature with non-Energy Star compliant monitors may cause video distortion when the Energy Save timeout occurs.

---

If you purchased your workstation with Energy Star-enabled, your system will go into Standby (a power management feature) after 15 or 20 minutes of inactivity. To wake from Standby, press a key on the keyboard or move the mouse.

To view, modify or enable/disable the power management feature, refer to the “Power Management” section below.

---



Should you have to restore the operating system, your Energy Star settings will need to be reset.

---

### 3.3.13 Power Management

Power Management is a feature that saves energy by shutting down certain components of the workstation when they are not in use, saving energy without having to shut down the workstation.

With Advanced Configuration and Power Interface (ACPI) enabled for Windows 2000 and Windows XP, timeouts (the period of inactivity allowed before shutting down these components) can be enabled, customized, or disabled using the operating system.

1. In Windows 2000, left click on the **Start Button**, then select **Settings > Control Panel > Power Options**.

In Windows XP, left click on the **Start Button**, then select **Control Panel > Performance and Maintenance > Power Options**.

2. In the **Power Options Properties**, select the **Power Schemes** tab.
3. Select the desired power scheme settings.

Use Display Properties to establish, modify, or disable Power Management settings for the monitor. To access Display Properties, right click on the **Windows Desktop**, then choose **Properties**.

### 3.3.14 World Wide Web Site

When making the transition to new or revised operating systems, it is important to implement the support software designed for that operating system. If you plan to run a version of Microsoft Windows that is different from the version included with your workstation, you must install corresponding device drivers and utilities to ensure that all features are supported and functioning properly.

HP has made the task of locating, accessing, evaluating, and installing the latest support software easier. You can download the software from <http://www.hp.com/support>. The Web site contains the latest device drivers, utilities, and flashable ROM images needed to run the latest Microsoft Windows operating system on your HP workstation.

### 3.3.15 Building Blocks and Partners

HP management solutions integrate with other systems management applications, and are based on industry standards, such as:

- Desktop Management Interface (DMI) 2.0
- Wake on LAN Technology
- ACPI
- SMBIOS
- Pre-boot Execution (PXE) support

## 3.4 Asset Tracking and Security

Asset tracking features incorporated into the workstation provide key asset tracking data that can be managed using HP Insight Manager, HP Client Manager or other system management applications. Seamless, automatic integration between asset tracking features and these products enables you to choose the management tool that is best suited to your environment and to leverage your investment in existing tools.

HP also offers several solutions for controlling access to valuable components and information. Security features such as the Smart Cover Sensor and the Smart Cover Lock, available on select models, help to prevent unauthorized access to the internal components of the workstation. By disabling parallel, serial, or USB ports, or by disabling removable media boot capability, you can protect valuable data assets. Memory Change and Smart Cover Sensor alerts can be automatically forwarded to system management applications to deliver proactive notification of tampering with a workstation's internal components.



The Smart Cover Sensor and the Smart Cover Lock are available as options on select systems.

Use the following utilities to manage security settings on your HP workstation:

- Locally, using the Computer Setup Utilities.
- Remotely, using HP Client Manager or System Software Manager. This software enables the secure, consistent deployment and control of security settings from a simple command-line utility.

The following table and sections refer to managing security features of your workstation locally through the Computer Setup Utilities (F10).

### Security Features Overview

Feature	Purpose	How It Is Established
Removable Media Boot Control	Prevents booting from the removable media drives.	From the Computer Setup Utilities (F10) menu.
Serial, Parallel, USB, or Infrared Interface Control	Prevents transfer of data through the integrated serial, parallel, USB (universal serial bus), or infrared interface.	From the Computer Setup Utilities (F10) menu.
Power-On Password	Prevents use of the workstation until the password is entered. This can apply to both initial system startup and restarts.	From the Computer Setup Utilities (F10) menu.
Setup Password	Prevents reconfiguration of the workstation (use of the Computer Setup Utilities) until the password is entered.	From the Computer Setup Utilities (F10) menu.
DriveLock	Prevents unauthorized access to the data on specific hard drives. This feature is available on select models only.	From the Computer Setup Utilities (F10) menu.



Support for security features may vary depending on your specific workstation configuration.

**Security Features Overview** (Continued)

Feature	Purpose	How It Is Established
Smart Cover Sensor	Indicates that workstation cover or side panel has been removed. Can be set to require the setup password to restart the workstation, after the cover or side panel has been removed. Refer to the <i>Hardware Reference Guide</i> on the <i>Documentation Library</i> CD for more information about this feature. This feature is available on select models only.	From the Computer Setup Utilities (F10) menu.
Master Boot Record Security	May prevent unintentional or malicious changes to the Master Boot Record of the current bootable disk, and provides a means of recovering the "last known good" MBR.	From the Computer Setup Utilities (F10) menu.
Memory Change Alerts	Detects when memory modules have been added, moved, or removed; notifies user and system administrator.	For information on enabling Memory Change Alerts, refer to the online <i>Intelligent Manageability Guide</i> .
Ownership Tag	Displays ownership information, as defined by the system administrator, during system startup (protected by setup password).	From the Computer Setup Utilities (F10) menu.
Cable Lock Provision	Inhibits access to the interior of the workstation to prevent unwanted configuration changes or component removal. Can also be used to secure the workstation to a fixed object to prevent theft.	Install a cable lock to secure the workstation to a fixed object.
Security Loop Provision	Inhibits access to the interior of the workstation to prevent unwanted configuration changes or component removal.	Install a lock in the security loop to prevent unwanted configuration changes or component removal.



Support for security features may vary depending on your specific workstation configuration.



### 3.4.1 Password Security

The power-on password prevents unauthorized use of the workstation by requiring entry of a password to access applications or data each time the workstation is turned on or restarted. The setup password specifically prevents unauthorized access to Computer Setup, and can also be used as an override to the power-on password. That is, when prompted for the power-on password, entering the setup password instead will allow access to the workstation.

A network-wide setup password can be established to enable the system administrator to log in to all network systems to perform maintenance without having to know the power-on password, even if one has been established.

### 3.4.2 Establishing a Setup Password Using Computer Setup

Establishing a setup password through Computer Setup prevents reconfiguration of the workstation (use of the Computer Setup (F10) utility) until the password is entered.

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.



If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select **Security**, then select **Setup Password** and follow the instructions on the screen.
4. Before exiting, click **File > Save Changes and Exit**.

### 3.4.3 Establishing a Power-On Password Using Computer Setup

Establishing a power-on password through Computer Setup prevents access to the workstation when power is turned on, unless the password is entered. When a power-on password is set, Computer Setup presents Password Options under the Security menu. Password options include Password Prompt on Warm Boot. When Password Prompt on Warm Boot is enabled, the password must also be entered each time the workstation is rebooted.

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.



If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select **Security**, then **Power-On Password** and follow the instructions on the screen.
4. Before exiting, click **File > Save Changes and Exit**.

#### Entering a Power-On Password

To enter a power-on password, complete the following steps:

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.

2. When the key icon appears on the monitor, type your current password, then press **Enter**.



---

Type carefully; for security reasons, the characters you type do not appear on the screen.

---

If you enter the password incorrectly, a broken key icon appears. Try again. After three unsuccessful tries, you must turn off the workstation, then turn it on again before you can continue.

## Entering a Setup Password

If a setup password has been established on the workstation, you will be prompted to enter it each time you run Computer Setup.

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green.



---

If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

---

3. When the key icon appears on the monitor, type the setup password, then press the **Enter** key.



---

Type carefully; for security reasons, the characters you type do not appear on the screen.

---

If you enter the password incorrectly, a broken key icon appears. Try again. After three unsuccessful tries, you must turn off the workstation, then turn it on again before you can continue.

## Changing a Power-On or Setup Password

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**. To change the setup password, run **Computer Setup**.
2. When the key icon appears, type your current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:  
**current password/new password/new password**



---

Type carefully; for security reasons, the characters you type do not appear on the screen.

---

3. Press the **Enter** key.

The new password takes effect the next time you turn on the workstation.



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Refer to the “National Keyboard Delimiter Characters” section in this chapter for information about the alternate delimiter characters.

The power-on password and setup password may also be changed using the Security options in Computer Setup.

---

## Deleting a Power-On or Setup Password

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**. To delete the setup password, run **Computer Setup**.

2. When the key icon appears, type your current password followed by a slash (/) or alternate delimiter character as shown:  
**current password/**
3. Press the **Enter** key.



Refer to “National Keyboard Delimiter Characters” for information about the alternate delimiter characters. The power-on password and setup password may also be changed using the Security options in Computer Setup.

---

## National Keyboard Delimiter Characters

Each keyboard is designed to meet country-specific requirements. The syntax and keys that you use for changing or deleting your password depend on the keyboard that came with your workstation.

National Keyboard Delimiter Characters					
Arabic	/	Greek	-	Russian	/
Belgian	=	Hebrew	.	Slovakian	-
BHCSY*	-	Hungarian	-	Spanish	-
Brazilian	/	Italian	-	Swedish/Finnish	/
Chinese	/	Japanese	/	Swiss	-
Czech	-	Korean	/	Taiwanese	/
Danish	-	Latin American	-	Thai	/
French	!	Norwegian	-	Turkish	.
French Canadian	é	Polish	-	U.K. English	/
German	-	Portuguese	-	U.S. English	/

\* For Bosnia-Herzegovina, Croatia, Slovenia, and Yugoslavia

## Clearing Passwords

If you forget your password, you cannot access the workstation. Refer to the “Troubleshooting” section of this guide for instructions on clearing passwords.

### 3.4.4 DriveLock

DriveLock is an industry-standard security feature that prevents unauthorized access to the data on specific hard drives. DriveLock has been implemented as an extension to Computer Setup. It is only available on certain systems and only when DriveLock-capable hard drives are detected.

DriveLock is intended for HP customers for whom data security is the paramount concern. For such customers, the cost of the hard drive and the loss of the data stored on it is inconsequential when compared with the damage that could result from unauthorized access to its contents. In order to balance this level of security with the practical need to accommodate a forgotten password, the HP implementation of DriveLock employs a two-password security scheme. One password is intended to be set and used by a system administrator while the other is typically set and used by the end-user. There is no “back-door” that can be used to unlock the drive if both passwords are lost. Therefore, DriveLock is most safely used when the data contained on the hard drive is replicated on a corporate information system or is regularly backed up.

In the event that both DriveLock passwords are lost, the hard drive is rendered unusable. For users who do not fit the previously defined customer profile, this may be an unacceptable risk. For users who do fit the customer profile, it may be a tolerable risk given the nature of the data stored on the hard drive.

## Using DriveLock

The DriveLock option appears under the Security menu in Computer Setup. The user is presented with options to set the master password or to enable DriveLock. A user password must be provided in order to enable DriveLock. Since the initial configuration of DriveLock is

typically performed by a system administrator, a master password should be set first. HP encourages system administrators to set a master password whether they plan to enable DriveLock or keep it disabled. This will give the administrator the ability to modify DriveLock settings if the drive is locked in the future. Once the master password is set, the system administrator may enable DriveLock or choose to keep it disabled.

If a locked hard drive is present, POST will require a password to unlock the device. If a power-on password is set and it matches the device's user password, POST will not prompt the user to re-enter the password. Otherwise, the user will be prompted to enter a DriveLock password. Either the master or the user password may be used. Users will have two attempts to enter a correct password. If neither attempt succeeds, POST will continue but the drive will remain inaccessible.

## **DriveLock Applications**

The most practical use of the DriveLock security feature is in a corporate environment where a system administrator provides users with multibay hard drives for use in some workstations. The system administrator would be responsible for configuring the multibay hard drive which would involve, among other things, setting the DriveLock master password. In the event that the user forgets the user password or the equipment is passed on to another employee, the master password can always be used to reset the user password and regain access to the hard drive.


HP recommends that corporate system administrators who choose to enable DriveLock also establish a corporate policy for setting and maintaining master passwords. This should be done to prevent a situation where an employee intentionally or unintentionally sets both DriveLock passwords before leaving the company. In such a scenario, the hard drive would be rendered unusable and require replacement. Likewise, by not setting a master password, system administrators may find themselves locked out of a hard drive and unable to perform routine checks for unauthorized software, other asset control functions, and support.

For users with less stringent security requirements, HP does not recommend enabling DriveLock. Users in this category include personal users or users who do not maintain sensitive data on their hard drives as a common practice. For these users, the potential loss of a hard drive resulting from forgetting both passwords is much greater than the value of the data DriveLock has been designed to protect. Access to Computer Setup and DriveLock can be restricted through the Setup password. By specifying a Setup password and not giving it to end users, system administrators are able to restrict users from enabling DriveLock.

## 3.5 Smart Cover Sensor (Optional)

Smart Cover Sensor is a combination of hardware and software technology that can alert you when the workstation cover or side panel has been removed. There are three levels of protection, as described in the following table.


Smart Cover Sensor Protection Levels		
Level	Setting	Description
Level 0	Disabled	Smart Cover Sensor is disabled (default).
Level 1	Notify User	When the workstation is restarted, the screen displays a message indicating that the workstation cover or side panel has been removed.
Level 2	Setup Password	When the workstation is restarted, the screen displays a message indicating that the workstation cover or side panel has been removed. You must enter the setup password to continue.

 These settings can be changed using Computer Setup.

### Setting the Smart Cover Sensor Protection Level

To set the Smart Cover Sensor protection level, complete the following steps:


1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.

 If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select **Security**, then **Smart Cover**, and follow the instructions on the screen.
4. Before exiting, click **File > Save Changes** and **Exit**.

### Smart Cover Lock (Optional)

The Smart Cover Lock is a software-controllable cover lock featured on select HP workstations. This lock prevents unauthorized access to the internal components. Workstations ship with the Smart Cover Lock in the unlocked position.

 **CAUTION:** For maximum cover lock security, be sure to establish a setup password. The setup password prevents unauthorized access to the Computer Setup utility.

## Locking the Smart Cover Lock

To activate and lock the Smart Cover Lock, complete the following steps:

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.



If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select **Security**, then select **Smart Cover** and the **Locked** option.
4. Before exiting, click **File > Save Changes** and **Exit**.

## Unlocking the Smart Cover Lock

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.



If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select **Security > Smart Cover > Unlocked**.
4. Before exiting, click **File > Save Changes** and **Exit**.

## Using the Smart Cover FailSafe Key

If you enable the Smart Cover Lock and cannot enter your password to disable the lock, you will need a Smart Cover FailSafe Key to open the workstation cover. You will need the key in any of the following circumstances:

- Power outage
- Startup failure
- PC component failure (such as processor or power supply)
- Forgotten password



**CAUTION:** The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need one (Tamper-resistant wrench PN 166527-001 or tamper-resistant bits PN 166527-002).

## 3.5.1 Master Boot Record Security

The Master Boot Record (MBR) contains information needed to successfully boot from a disk and to access the data stored on the disk. Master Boot Record Security may prevent unintentional or malicious changes to the MBR, such as those caused by some viruses or by the incorrect use of certain disk utilities. It also allows you to recover the “last known good” MBR, should changes to the MBR be detected when the system is restarted.

To enable MBR Security, complete the following steps:

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.



---

If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

---

3. Select **Security > Master Boot Record Security > Enabled**.
4. Select **Security > Save Master Boot Record**.
5. Before exiting, click **File > Save Changes and Exit**.

When MBR Security is enabled, the BIOS prevents any changes being made to the MBR of the current bootable disk while in MS-DOS or Windows Safe Mode.



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Most operating systems control access to the MBR of the current bootable disk; the BIOS cannot prevent changes that may occur while the operating system is running.

---

Each time the workstation is turned on or restarted, the BIOS compares the MBR of the current bootable disk to the previously saved MBR. If changes are detected and if the current bootable disk is the same disk from which the MBR was previously saved, the following message is displayed:

1999—Master Boot Record has changed.

Press any key to enter Setup to configure MBR Security.

Upon entering Computer Setup, you must

- Save the MBR of the current bootable disk;
- Restore the previously saved MBR; or
- Disable the MBR Security feature.

You must know the setup password, if one exists.

If changes are detected and if the current bootable disk is **not** the same disk from which the MBR was previously saved, the following message is displayed:

2000—Master Boot Record Hard Drive has changed.

Press any key to enter Setup to configure MBR Security.

Upon entering Computer Setup, you must

- Save the MBR of the current bootable disk; or
- Disable the MBR Security feature.

You must know the setup password, if one exists.

In the unlikely event that the previously saved MBR has been corrupted, the following message is displayed:

1998—Master Boot Record has been lost.

Press any key to enter Setup to configure MBR Security.



Upon entering Computer Setup, you must

- Save the MBR of the current bootable disk; or
- Disable the MBR Security feature.

You must know the setup password, if one exists.

### 3.5.2 Before You Partition or Format the Current Bootable Disk

Ensure that MBR Security is disabled before you change partitioning or formatting of the current bootable disk. Some disk utilities, such as FDISK and FORMAT, attempt to update the MBR. If MBR Security is enabled when you change partitioning or formatting of the disk, you may receive error messages from the disk utility or a warning from MBR Security the next time the workstation is turned on or restarted. To disable MBR Security, complete the following steps:

1. Turn on or restart the workstation. If you are in Windows, click **Start > Shut Down > Restart the Computer**.
2. Press the **F10** key as soon as the monitor light turns green. Press **Enter** to bypass the title screen, if necessary.



If you do not press the **F10** key at the appropriate time, you must turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select **Security > Master Boot Record Security > Disabled**.
4. Before exiting, click **File > Save Changes and Exit**.

### 3.5.3 Cable Lock Provision

The rear panel of the workstation accommodates a cable lock so that the workstation can be physically secured to a work area.

For illustrated instructions, please see the “Removal and Replacement” Chapter.

## 3.6 Fault Notification and Recovery

Fault Notification and Recovery features combine innovative hardware and software technology to prevent the loss of critical data and minimize unplanned downtime.

When a fault occurs, the workstation displays a Local Alert message containing a description of the fault and any recommended actions. You can then view current system health by using the HP Client Manager Software. If the workstation is connected to a network managed by HP Insight Manager, HP Client Manager Software, or other system management applications, the workstation also sends a fault notice to the network management application.

### 3.6.1 Drive Protection System

The Drive Protection System (DPS) is a diagnostic tool built into the hard drives installed in select HP workstations. DPS is designed to help diagnose problems that might result in unwarranted hard drive replacement.

When HP workstations are built, each installed hard drive is tested using DPS, and a permanent record of key information is written onto the drive. Each time DPS is run, test results are written to the hard drive. Your service provider can use this information to help diagnose conditions that caused you to run the DPS software.

### **3.6.2 Surge-Tolerant Power Supply**

An integrated surge-tolerant power supply provides greater reliability when the workstation is hit with an unpredictable power surge. This power supply is rated to withstand a power surge of up to 2000 volts without incurring any system downtime or data loss.

### **3.6.3 Thermal Sensor**

The thermal sensor is a hardware and software feature that tracks the internal temperature of the workstation. This feature displays a warning message when the normal range is exceeded, which gives you time to take action before internal components are damaged or data is lost.

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## Identifying the Chassis, Routine Care, and Disassembly Preparation

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This chapter provides general service information for the workstation. Adherence to the procedures and precautions described in this chapter is essential for proper service.



**CAUTION:** When the workstation is plugged into an AC power source voltage is always applied to the system board. You must disconnect the power cord from the power source before opening the workstation to prevent system board or component damage.

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### 4.1 Small Form Factor (SFF)

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If the computer is in the desktop configuration, ensure at least 6 inches (15.24 cm) of space on all sides of the computer remains clear and free of obstructions.

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Chassis color scheme may differ than the one shown above.

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## 4.2 Electrostatic Discharge Information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs. An electronic device exposed to electrostatic discharge (ESD) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

Networks built into many integrated circuits provide some protection, but in many cases, the discharge contains enough power to alter device parameters or melt silicon junctions.

### 4.2.1 Generating Static

The following table shows that:

- Different activities generate different amounts of static electricity.
- Static electricity increases as humidity decreases.

Event	Relative Humidity		
	55%	40%	10%
Walking across carpet	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing DIPs* from plastic tube	400 V	700 V	2,000 V
Removing DIPs* from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs* from Styrofoam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V

\*These are then multi-packaged inside plastic tubes, trays, or Styrofoam.



700 volts can degrade a product.

### 4.2.2 Preventing Electrostatic Damage to Equipment

Many electronic components are sensitive to ESD. Circuitry design and structure determine the degree of sensitivity. The following packaging and grounding precautions are necessary to prevent damage to electric components and accessories.

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.
- Keep electrostatic sensitive parts in their containers until they arrive at static-free stations.
- Place items on a grounded surface before removing them from their container.
- Always be properly grounded when touching a sensitive component or assembly.
- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

### 4.2.3 Personal Grounding Methods and Equipment

Use the following equipment to prevent static electricity damage to equipment:

- **Wrist straps** are flexible straps with a maximum of one-megohm  $\pm$  10% resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.
- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one-megohm  $\pm$  10% resistance between the operator and ground.

Static Shielding Protection Levels	
Method	Voltage
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

### 4.2.4 Grounding the Work Area

To prevent static damage at the work area, use the following precautions:

- Cover the work surface with approved static-dissipative material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.
- Use static-dissipative mats, foot straps, or air ionizers to give added protection.
- Handle electrostatic sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only at static-free work areas.
- Turn off power and input signals before inserting and removing connectors or test equipment.
- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.
- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

### 4.2.5 Recommended Materials and Equipment

Materials and equipment that are recommended for use in preventing static electricity include:

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids
- Conductive foam
- Conductive tabletop workstations with ground cord of one-megohm  $\pm$  10% resistance
- Static-dissipative table or floor mats with hard tie to ground
- Field service kits

- Static awareness labels
- Wrist straps and footwear straps providing one-megohm +/- 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

## **4.3 Routine Care**

### **4.3.1 General Cleaning Safety Precautions**

1. Never use solvents or flammable solutions to clean the workstation.
2. Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
3. Always unplug the workstation when cleaning with liquids or damp cloths.
4. Always unplug the workstation before cleaning the keyboard, mouse, or air vents.
5. Disconnect the keyboard before cleaning it.
6. Wear safety glasses equipped with side shields when cleaning the keyboard.

### **4.3.2 Cleaning the Workstation Case**

Follow all safety precautions in Section [4.3.1](#) before cleaning the workstation.

To clean the workstation case, follow the procedures described below:

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is needed as the alcohol will evaporate quickly and not leave a residue.
- After cleaning, always wipe the unit with a clean, lint-free cloth.
- Occasionally clean the air vents on the workstation. Lint and other foreign matter can block the vents and limit the airflow.

### 4.3.3 Cleaning the Keyboard

Follow all safety precautions in Section 4.3.1 before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in Section 4.3.2.

When cleaning debris from under the keys, review all rules in Section 4.3.1 before following these procedures:



**CAUTION:** Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.
- Canned, pressurized air may be used to clean debris from under the keys. Caution should be used as too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.



**CAUTION:** Never remove a wide leveled key (like the space bar) from the keyboard. If these keys are improperly removed or installed, the keyboard may not function properly.

- Cleaning under a key may be done with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Use tweezers to remove any fibers or dirt in confined areas. Allow the parts to air dry before reassembly.

### 4.3.4 Cleaning the Monitor

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body follow the procedures in Section 4.3.2.

### 4.3.5 Cleaning the Mouse

Before cleaning the mouse, ensure that the power to the workstation is turned off.

- Clean the mouse ball by first removing the retaining plate and the ball from the housing. Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.
- To clean the mouse body, follow the procedures in Section 4.3.

## 4.4 Service Considerations

Listed below are some of the considerations that you should keep in mind during the disassembly and assembly of the workstation.

### 4.4.1 Power Supply Fan

The power supply fan is a variable-speed fan based on the temperature in the power supply.



**CAUTION:** The cooling fan is off **only** when the workstation is turned off or the power cable has been disconnected.

The cooling fan is always on when the workstation is either in the "On," "Standby," or "Suspend" modes.

You must disconnect the power cord from the power source before opening the workstation to prevent system board or component damage.

---

### 4.4.2 Tools and Software Requirements

To service the workstation, you need the following:

- Torx T-15 screwdriver (Compaq screwdriver with bits, PN 161946-001)
- Torx T-15 screwdriver with small diameter shank (for certain front bezel removal)
- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)
- Diagnostics software
- Compaq tamper-resistant T-15 wrench (Smart Cover FailSafe Key, PN 166527-001) or Compaq tamper-resistant bits (Smart Cover FailSafe Key, PN 166527-002)

### 4.4.3 Screws

The screws used in the workstation are not interchangeable. They may have standard or metric threads and may be of different lengths. If an incorrect screw is used during the reassembly process, it can damage the unit. HP strongly recommends that all screws removed during disassembly be kept with the part that was removed, then returned to their proper locations.



Metric screws have a black finish.  
U.S. screws have a silver finish.

---



As each subassembly is removed from the workstation, it should be placed away from the work area to prevent damage.

---



## 4.4.4 Cables and Connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.



**CAUTION:** When servicing this workstation, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the workstation.

## 4.4.5 Hard Drives

Handle hard drives as delicate, precision components, avoiding all physical shock and vibration. This applies to failed drives as well as replacement spares.

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package “Fragile: Handle With Care.”
- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the CPU.
- Avoid dropping drives from any height onto any surface.
- If you are inserting or removing a hard drive, turn off the workstation. Do not remove a hard drive while the workstation is on or in standby mode.
- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to Section 4.2, “Electrostatic Discharge Information.”
- Do not use excessive force when inserting a drive.
- Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

## 4.4.6 Lithium Coin Cell Battery

The battery that comes with the workstation provides power to the real-time clock and has a minimum lifetime of about three years.

See the appropriate removal and replacement chapter for the chassis you are working on in this guide for instructions on the replacement procedures.



**WARNING:** This workstation contains a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short external contacts, dispose in water or fire, or expose it to temperatures higher than 140°F (60°C).



**CAUTION:** Batteries, battery packs, and accumulators should not be disposed of together with the general household waste.



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## Removal and Replacement Procedures

Adherence to the procedures and precautions described in this chapter is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.



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Not all features listed in this guide are available on all workstations.

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### 5.1 Preparation for Disassembly

See Chapter 4, 'Identifying the Chassis, Routine Care, and Disassembly Preparation' for initial procedures.

1. Remove/disengage any security devices that prohibit opening the workstation (Section 5.2 and 5.4).
2. Close any open software applications.
3. Exit the operating system.
4. Remove any media such as a diskette or compact disc from the workstation.
5. Turn off the workstation and any peripheral devices that are connected to it.



---

**CAUTION:** Turn off the workstation before disconnecting any cables.

---



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**CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the workstation is in the "Standby," or "Suspend" modes. The power cord should always be disconnected before servicing a unit.

---

6. Disconnect the power cord from the electrical outlet and then from the workstation.
7. Disconnect all peripheral device cables from the workstation.



---

During disassembly, label each cable as you remove it, noting its position and routing. Keep all screws with the units removed.

---



---

**CAUTION:** The screws used in the workstation are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.

---

## 5.2 Unlocking the Smart Cover Lock

If you have locked the Smart Cover Lock use Computer Setup to unlock the lock. Refer to the *Desktop Management Guide* on the *Documentation Library* CD for more information about the Smart Cover Lock.

If you cannot access Computer Setup to unlock the cover you will need to remove the locking solenoid by using the Smart Cover FailSafe Key (Spare part number 166527-001 or 166527-002). Once the solenoid has been deactivated or removed the access panel can be removed.

The Smart Cover FailSafe Key will be needed in any of the following circumstances:

- Power outage
- Startup failure
- Processor or power supply failure
- Lost password

1. Using the Smart Cover FailSafe Key, remove the two tamper-proof screws that secure the Smart Cover Lock to the inside of the chassis.

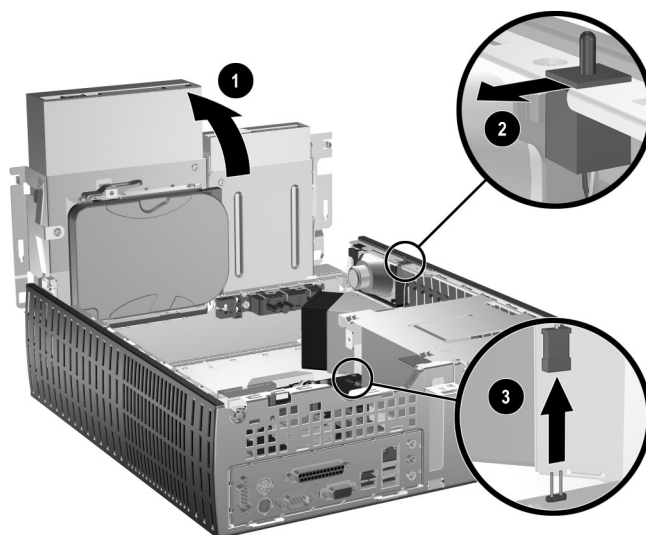


2. Remove the workstation access panel (Section [5.5](#)).

To reattach the Smart Cover Lock, position the lock so that the printed circuit board it is attached to points down when the workstation is oriented as shown. Then, secure the lock in place with the two tamper-proof screws.

## 5.3 Hood Sensor

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Remove the front bezel (Section 5.6).
4. Raise the drive cage to its upright position ❶.
5. Slide the hood sensor switch towards the inside of the workstation ❷.
6. Disconnect the hood sensor cable from the system board ❸.



To install the hood sensor, reverse the removal procedure.

## 5.4 External Security Devices

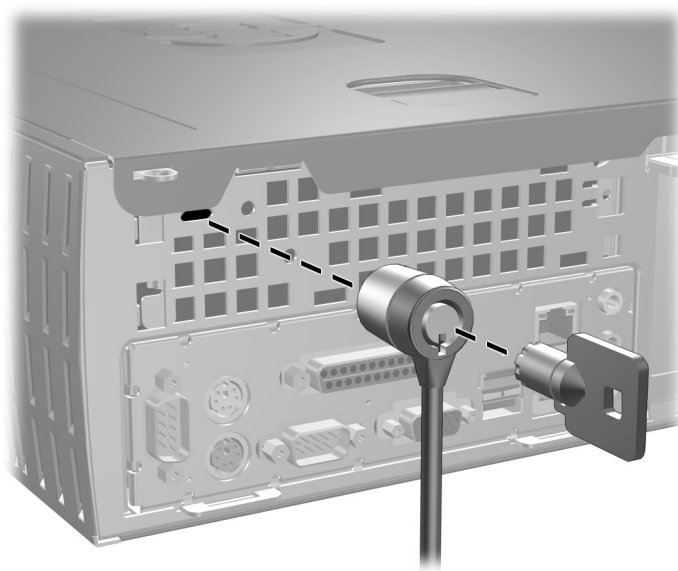
### 5.4.1 Cable Lock

The cable lock may be used to secure the workstation access panel to the chassis and, at the same time, secure the workstation to a fixed object.



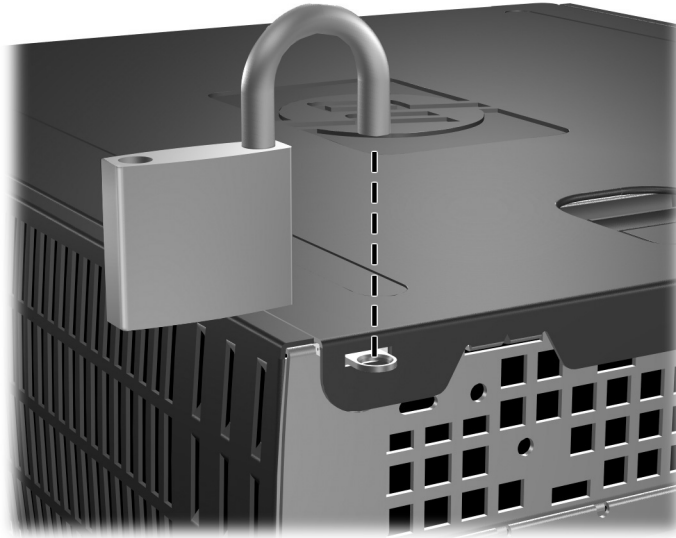
The workstation is cable-lock compatible, but HP does not offer the lock as an after market product.

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## 5.4.2 Padlock

A padlock may be used by itself to secure the access panel to the workstation chassis. A padlock may also be used with a security cable to secure the workstation to a fixed object.



## 5.5 Workstation Access Panel

1. Prepare the workstation for disassembly (Section 5.1).



**CAUTION:** Before removing the workstation access panel, ensure that the workstation is turned off and that the power cord is disconnected from the electrical outlet.

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2. Pull up and hold open the latch on the top of the workstation ❶.
3. Slide the workstation cover ❷ back about 0.5inch (1.3 cm), then lift it off the unit.

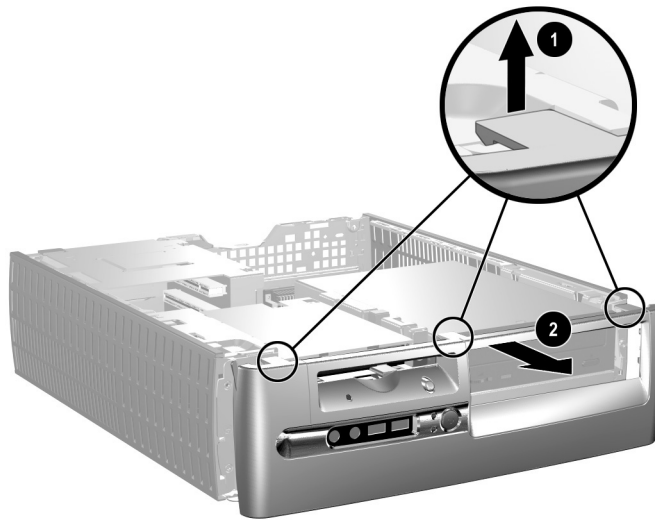


To install the workstation cover, reverse the removal procedure.



## 5.6 Front Bezel

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Pull up on the three release tabs **1** on the top of the bezel, then pull the front bezel away from the chassis **2**.



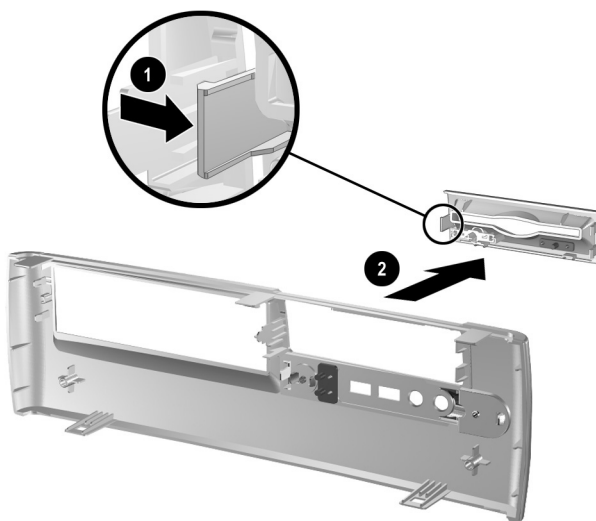
To reinstall the front bezel, reverse the removal procedure

## 5.7 Front Drive Bezels

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Remove the front bezel (Section 5.6).

### 5.7.1 Diskette Drive Bezel or Bezel Blank

Press the large retaining tab **1** on the left side of the bezel insert to the left and push the cover out of the front bezel **2**.



To install a bezel or a bezel blank, reverse the removal procedure.

## 5.8 Memory

**CAUTION:** The memory module sockets have gold metal contacts. When upgrading the memory, it is important to use memory modules with gold metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

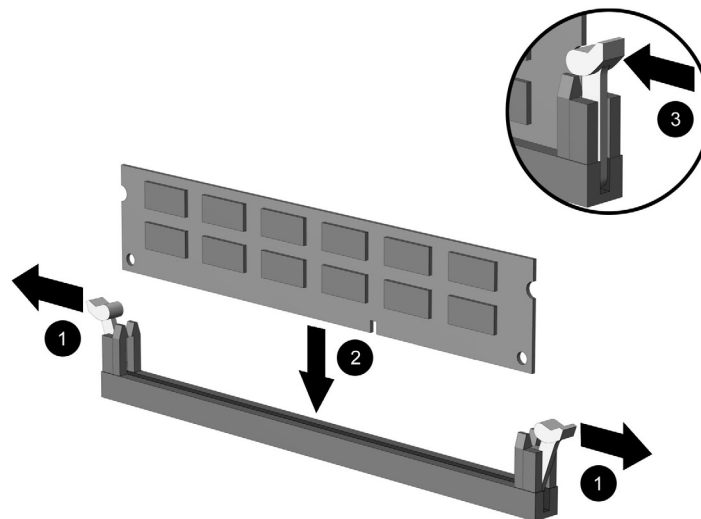
**CAUTION:** Static electricity can damage the electronic components of the workstation or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. Refer to Chapter 4 for more information.


**CAUTION:** When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).

**WARNING:** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

4. Open both latches of the memory module socket ❶, and insert the memory module into the socket ❷. Begin by installing a module into the socket nearest the preinstalled module, and install the modules following the numerical order of the sockets.



 A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

5. Push the module down into the socket, ensuring that the module is fully inserted and properly seated. Make sure the latches are in the closed position ❸.
6. Repeat steps 4 and 5 for any additional modules that you want to install.

The workstation automatically recognizes the additional memory when the workstation is turned on.

To reassemble the workstation, reverse the removal procedure.



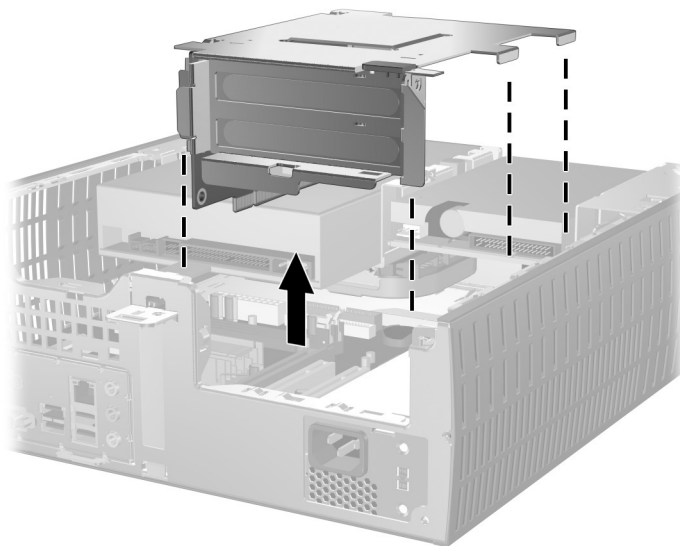
If you normally lock the Smart Cover Lock, use Computer Setup to relock the lock and enable the Smart Cover Sensor.

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For technical information on memory modules, refer to Appendix F, “Memory.”

## 5.9 Expansion Card Cage

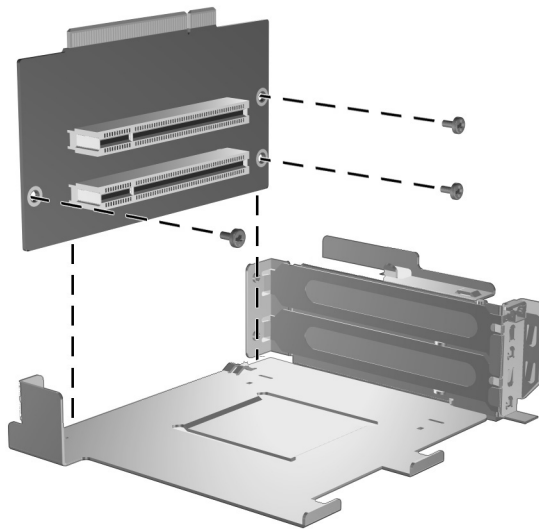
1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).
4. Disconnect all cables attached to the expansion cards.
5. Grasp the expansion card cage by the green labels (the cage in the workstation has two spots marked ❶) and pull it straight up from the chassis.



To install the card cage, reverse the removal procedures.

## 5.9.1 Riser Card

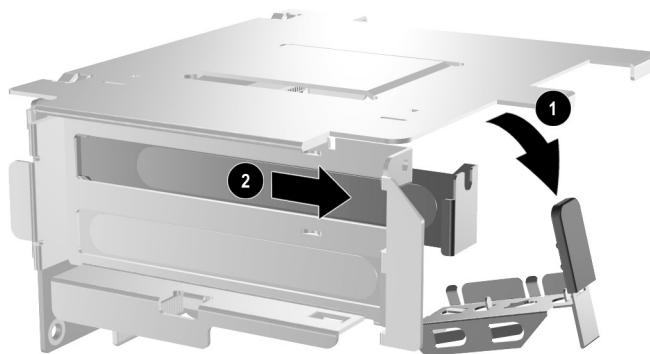
1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).
4. Remove the expansion card cage (Section 5.9).
5. Remove the three screws that secure the riser card to the expansion card cage, then remove the card.



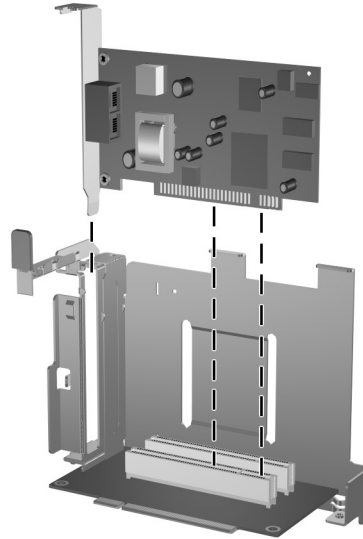
To install the riser card, reverse the removal procedure.

## 5.9.2 Expansion Card

1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).
4. Remove the expansion card cage (Section 5.9).
5. If you are installing a card for the first time, go to step 6.  
If you are removing an existing card, open the release latch as described in step 6 then go to step 8.
6. If you are installing an expansion card in a vacant socket, release the slot cover retention latch ❶ that secures the PCI slot covers by rotating the latch outwards (the latch in the workstation has a green label on it marked ❷).
7. Remove the slot cover by sliding it out ❷.



8. To remove an expansion card, hold the card at each end and carefully rock it back and forth until the connectors pull free from the socket. Lift the expansion card straight up to release it from the carrier. Be sure not to scrape the card against other components.



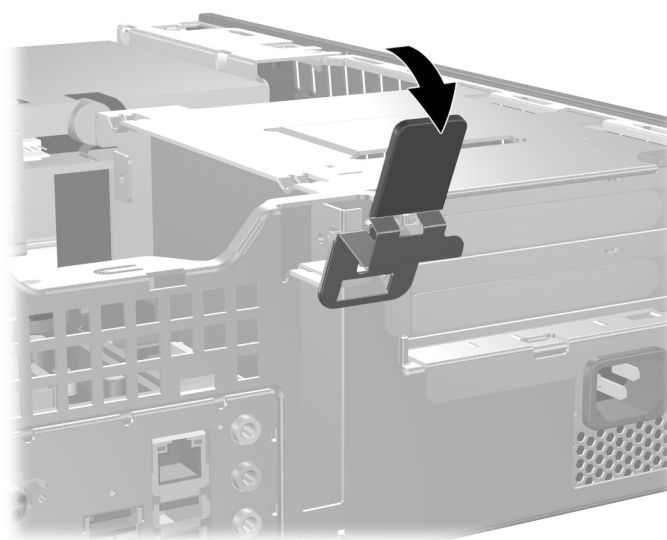
### 5.9.3 AGP Card

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Some graphics cards (such as the nVIDIA Quadro4 400 NVS) will require you to remove the diskette drive (or hard drive, if installed) from bay 1 to allow enough room to install the graphics card.

---

1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section [5.2](#)).
2. Prepare the workstation for disassembly (Section [5.1](#)).
3. Remove the workstation access panel (Section [5.5](#)).
4. Lift the green lever to unlock the AGP card.



5. If installing an AGP card for the first time, go to step 6.  
If removing an AGP card, go to step 9.
6. Remove the slot cover.
7. Slide the bracket on the end of the expansion card down into the slot on the back of the chassis and press the card down firmly into the socket on the system board.



When you install an expansion card, make sure you press firmly on the card so that the whole connector seats properly in the expansion card socket on the system board.

8. Close the expansion slot retention bracket by rotating it toward the chassis ❶ and pressing down on the thumb tabs ❷ so that they snap firmly into place.
9. To remove an AGP card, pull the retention arm away from the socket then carefully rock the card back and forth until the connectors pull free from the socket. Lift the expansion card straight up then pull it in toward the center of the chassis to release it from the chassis frame. Be sure not to scrape the card against other components.
10. Store the removed card in anti-static packaging.



**CAUTION:** After removing an expansion card, you must replace it with a new card or cover the open slot (for example, with a metal slot cover or a piece of duct tape) for proper cooling of internal components during operation.

11. Connect external cables to the installed card and internal cables to the system board as needed.
12. Replace the workstation cover.
13. If you normally lock the Smart Cover Lock, use Computer Setup to relock the lock and enable the Smart Cover Sensor.
14. Reconfigure the workstation, if necessary.



## 5.10 Drives

The workstation supports up to three drives.

This Section describes the procedure for replacing or upgrading the storage drives. A Torx T-15 screwdriver is needed to remove and install the guide screws on a drive.



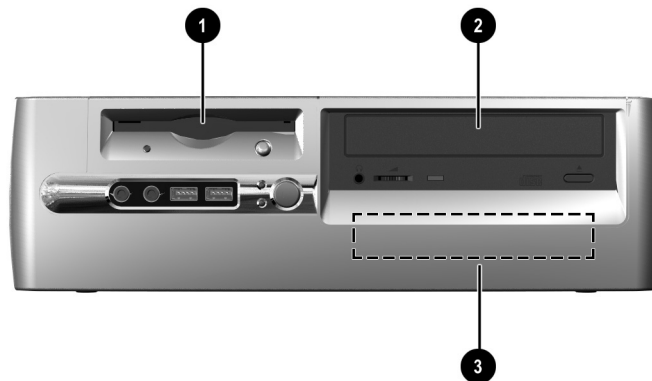
**CAUTION:** Make sure personal files on the hard drive are backed up to an external storage device before removing the hard drive. Failure to do so will result in data loss. After replacing the primary hard drive, you will need to run the *Restore Plus!* CD to load the Compaq factory-installed files.

### 5.10.1 Extra Screws

The following spare guide screws are included with the chassis (located inside) for installing new drives:

- Four 6-32 screws for installing an extra hard drive
- Four M3 screws for installing an optical or diskette drive

### 5.10.2 Drive Positions



Drive Positions			
Item	Description	Item	Description
❶	One standard 3.5-inch, one-third height bay (1.44-MB diskette drive shown)*	❸	Internal 3.5-inch, one-third height bay for hard drive
❷	5.25-inch drive bay for optional drives.		

\*If the workstation has a 1.44-MB diskette drive installed, it will be configured with a diskette drive bezel as shown in the illustration. If the workstation contains an empty 3.5-inch drive bay, then a bezel blank will be installed on the workstation instead. If you do not have a drive in this slot, you may choose to install a 3.5-inch device (such as a diskette drive or hard drive) later on. However, to install a 3.5-inch device other than a diskette drive or hard drive, you must order the 3.5-inch device bezel to provide proper air flow within the chassis.

To verify the type and size of the storage device installed in the workstation, run Computer Setup.

### 5.10.3 Optical Drive



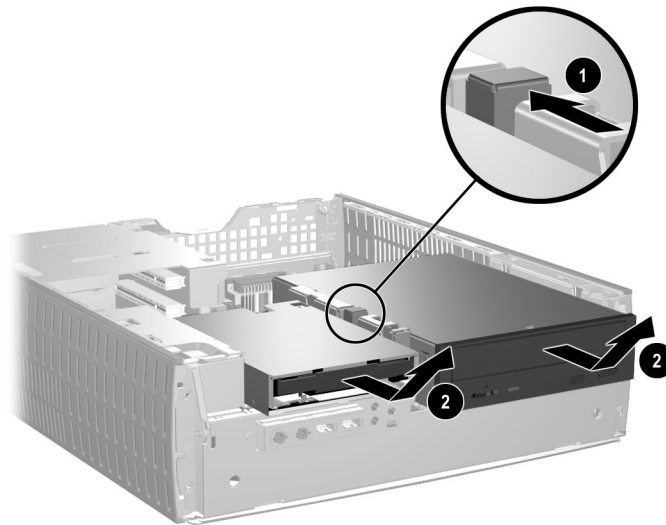
**CAUTION:** All removable media should be taken out of the drives before removing the drive from the workstation.



An optical drive is a CD-ROM, CD-RW, DVD-ROM, Combo, or DVD+RW drive.

1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).
4. Remove the front bezel (Section 5.6).
5. Raise the Easy Access drive bay (bay ❷ area) to the upright position.
6. Disconnect the audio, signal, and drive power cables from the drive. The other end of the cables should remain connected to the system board.
7. Return the Easy Access drive bay to the down position.

8. Push the drive release latch **1** toward the rear of the chassis and hold.
9. Slide the drive **2** toward the front of the drive cage, then lift the drive out of the workstation.



To replace the drive:

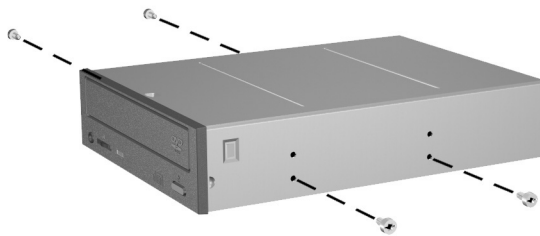
1. Install two guide screws in the lower holes on each side of the drive.



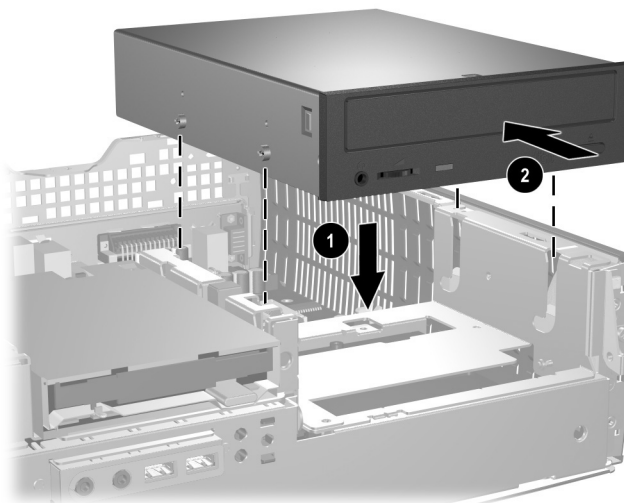
**CAUTION:** Use only 3/16-inch or 5-mm long screws as guide screws. Longer screws can damage the internal components of the drive.



When replacing the drive, transfer the four screws from the old drive to the new one. The screws take the place of drive rails. You will need a Torx T-15 screwdriver to remove and re-install the guide screws.



- 
2. Position the guide screws on the drive into the J-slots in the drive bay ❶. Then, slide the drive towards the rear of the workstation ❷.

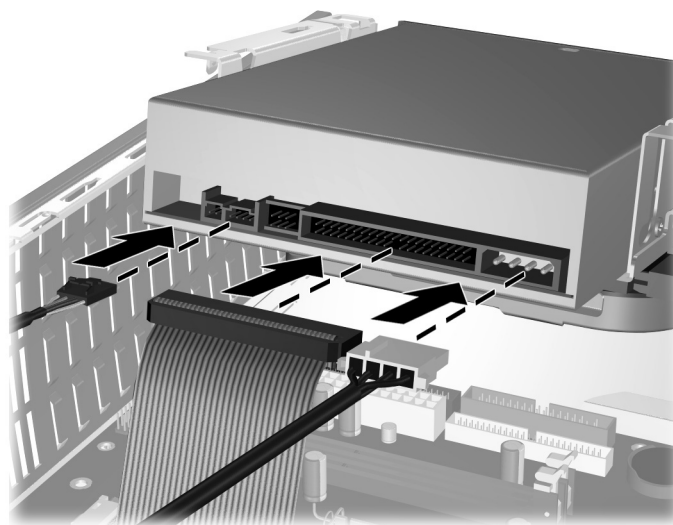


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The drive release latch automatically locks in place when installing a drive.

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- 
- 
3. Raise the Easy Access drive bay to the upright position and connect the flat ribbon cable and audio cable to the system board.



- 
- 
- 
4. Connect the power cable, flat ribbon cable, and audio cable to the rear of the optical drive.
5. Return the Easy Access drive bay to the down position. Be sure not to pinch the cables in the chassis when lowering the Easy Access drive bay.
6. Replace the front bezel and workstation access panel.

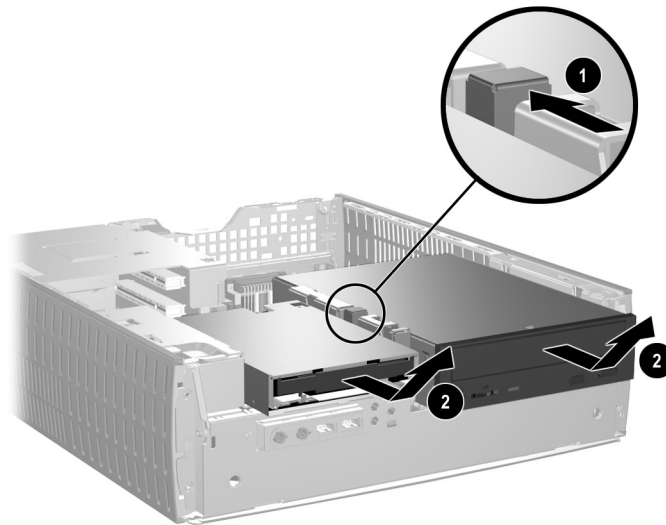
The system automatically recognizes the drive and reconfigures the workstation.



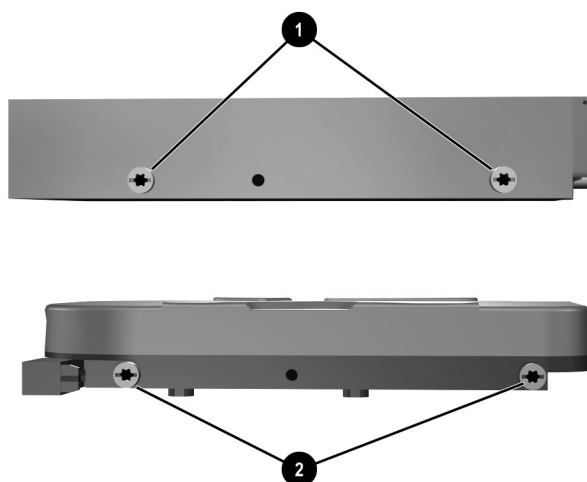
**CAUTION:** When servicing the workstation, ensure that cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the workstation.

## 5.10.4 External 3.5-inch Drive

1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).
4. Remove the front bezel (Section 5.6).
5. Raise the Easy Access drive bay to the upright position.
6. Disconnect the audio, signal, and drive power cables from the drive. The other end of the cables should remain connected to the system board.
7. Return the Easy Access drive bay to the down position.
8. Push the drive release latch **1** toward the rear of the chassis and hold.
9. Slide the drive **2** toward the front of the drive cage, then lift the drive out of the workstation.



When replacing the drive, transfer the four screws from the old drive to the new one. The screws take the place of drive rails. You will need a Torx T-15 screwdriver to remove and re-install the guide screws.

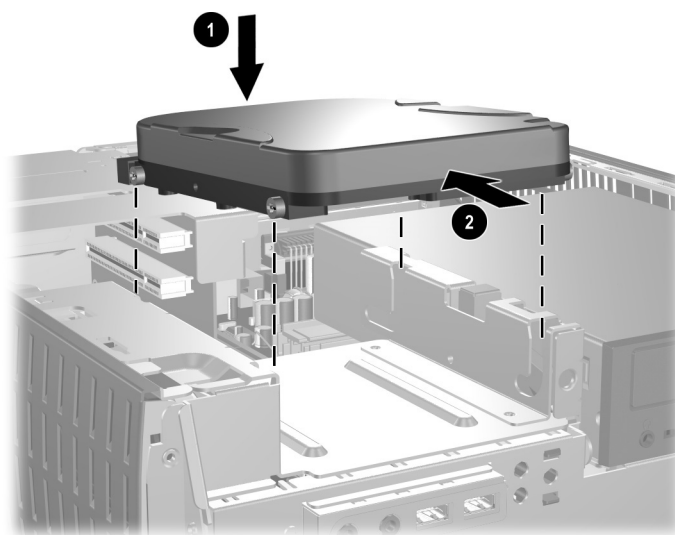


The guide screws on a 3.5-inch diskette drive ❶ are placed closer together than on the hard drive ❷.

10. Insert the rear screws of the hard drive ❶ into the rear J-slots. Slide the drive ❷ toward the back of the drive cage until the front screws are aligned with the front J-slots. Then lower the front of the drive. Continue to slide the drive all the way back until it locks into place.



If replacing a diskette drive, all guide screws (front and rear) will line up on the J-slots. Insert the guide screws into the J-slots, then slide the drive toward the back of the drive cage until it locks into place.

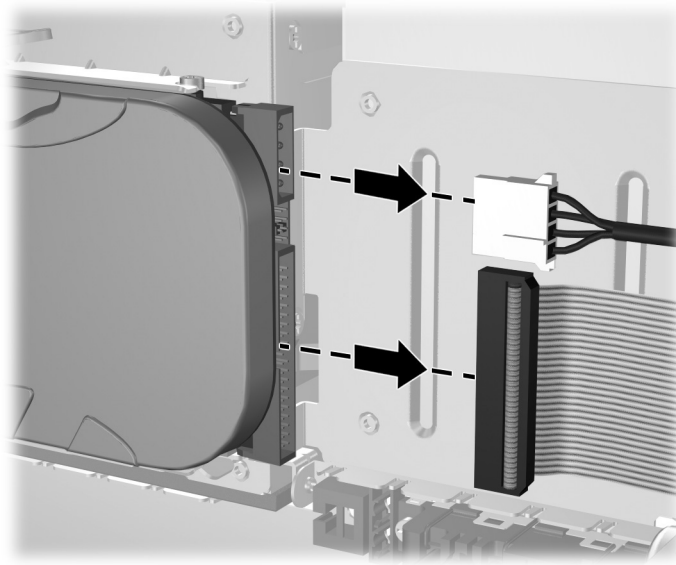


11. Connect the power and data cables.

12. Replace the front bezel and workstation access panel.

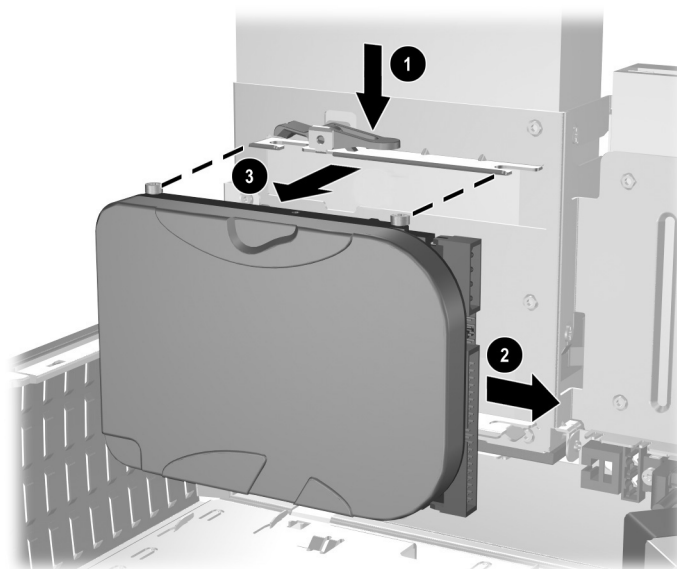
## 5.10.5 Primary Hard Drive

1. If you have locked the Smart Cover Lock, use Computer Setup to unlock the lock (Section 5.2).
2. Prepare the workstation for disassembly (Section 5.1).
3. Remove the workstation access panel (Section 5.5).
4. Remove the front bezel (Section 5.6).
5. Raise the Easy Access drive bay to the upright position.
6. Disconnect the power cable and signal cable from the back of the drive.



*Disconnecting Cables from the Hard Drive*

7. Press and hold the drive release latch ❶.
8. Slide the drive to the right of the bay ❷, then pull the drive from the bay ❸.



To replace the hard drive, reverse the above procedure.



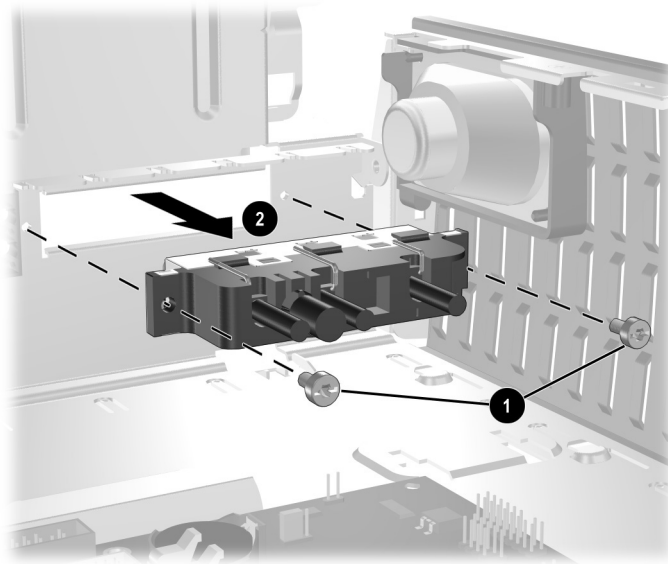
When replacing the hard drive, transfer the four screws from the old drive to the new one. The screws take the place of drive rails. You will need a Torx T-15 screwdriver to remove and re-install the guide screws.

---



## 5.11 Front I/O Devices

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Disconnect the two I/O device cables from the system board: the front USB cable pair and the front audio cable.
4. Remove the power supply from the chassis (Section 5.17).
5. From the inside of the chassis, remove the two screws that secure the I/O device to the chassis **1**, then pull the device into the chassis **2** to free it from its mount.



To install the housing assembly, reverse the removal procedures.

## 5.12 Power Switch Assembly

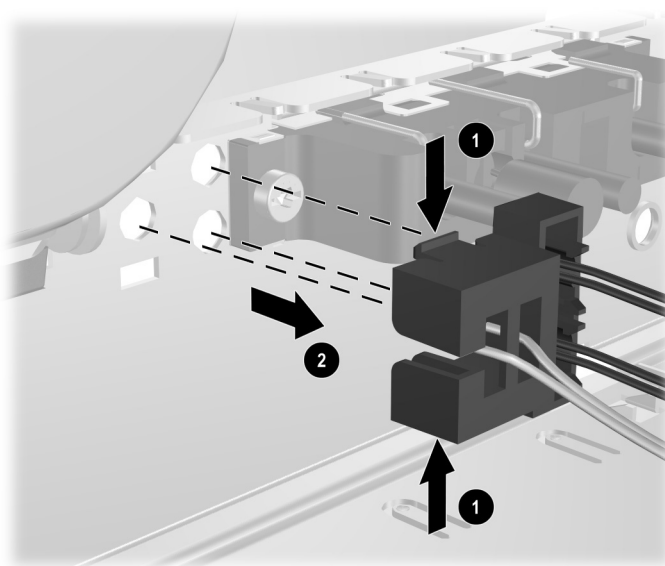
1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Disconnect the power switch/LED cable from the system board.
4. Carefully cut the cable tie that secures the power switch cable to the power supply cable bundle.



**CAUTION:** Be careful when cutting the cable tie not to cut any cables.

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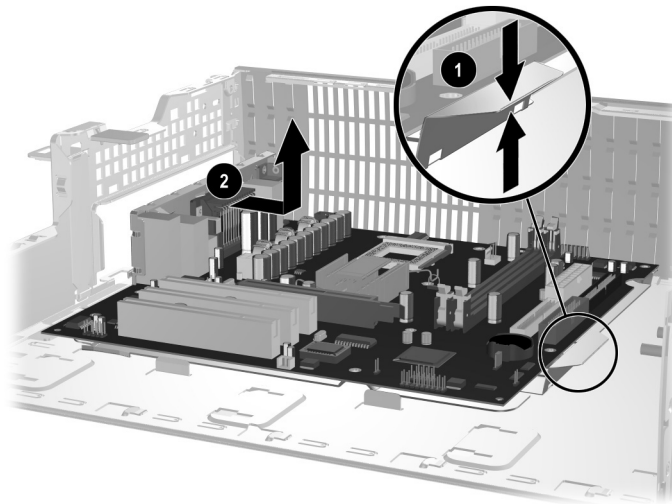
5. Squeeze the switch holder retaining clips together at the front of the chassis ❶ and push the switch assembly out of the chassis ❷.



To install the power switch assembly, reverse the removal procedure.

## 5.13 System Board

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Remove all PCI expansion boards (Section 5.9).
4. Remove the AGP graphics card (Section 5.9).
5. Disconnect all cables connected to the system board, noting their location for reinstallation.
6. Compress the system board tray handle ❶ to release the latch and slide the system board tray towards the front of the workstation ❷ to free it from the back of the chassis.



To install the system board with its tray, reverse the removal procedures.

## 5.14 Battery

The battery that comes with this workstation provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the workstation. The workstation comes with a 3-volt lithium coin cell battery.



The lifetime of the lithium battery can be extended by plugging the workstation into a live AC wall socket. The lithium battery is only used when the workstation is NOT connected to AC power.



**WARNING:** This workstation contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 140°F (60°C)
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace the battery only with the HP/Compaq spare designated for this product.



**CAUTION:** Before replacing the battery, it is important to back up the workstation CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared. Refer to the *Troubleshooting Guide* for information on backing up the CMOS settings.



Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP/Compaq, their authorized partners, or their agents.



**CAUTION:** Static electricity can damage the electronic components of the workstation or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

1. Prepare the workstation for disassembly (Section [5.1](#)).
2. Remove the workstation access panel (Section [5.5](#)).

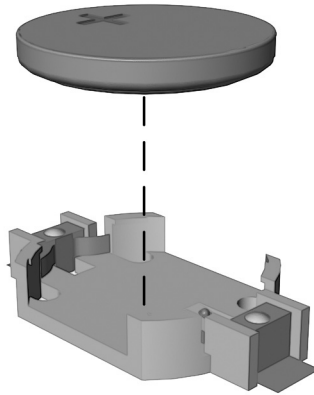


It may be necessary to remove an expansion card to gain access to the battery.

3. Locate the battery and battery holder on the system board.
4. Carefully pull the cable bundle out of the way to access the battery.
5. Depending on the type of battery holder on your system board, complete the following instructions to replace the battery:

### 5.14.1 Type 1 Battery Holder

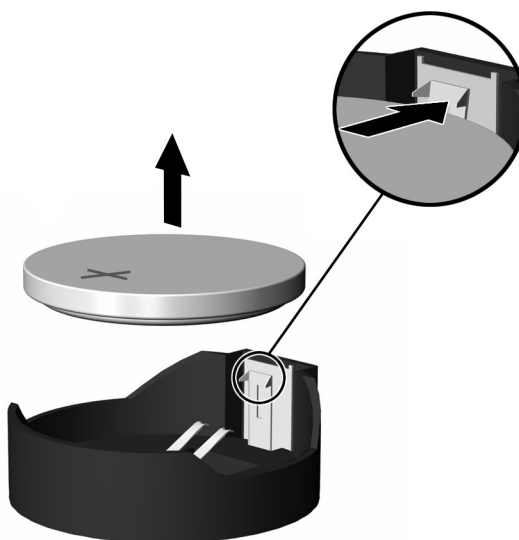
1. Lift the battery out of its holder.



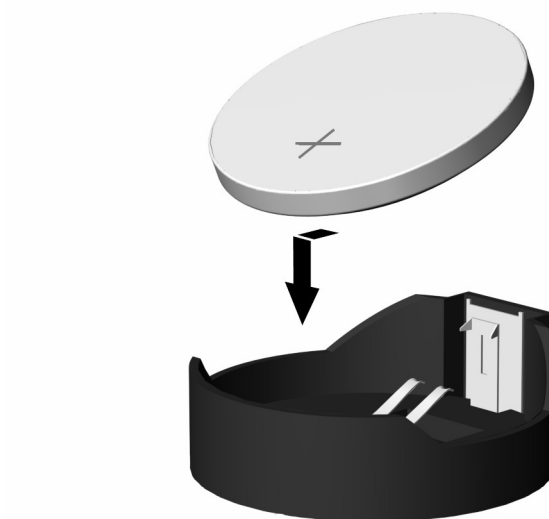
2. Slide the replacement battery into position, positive side up.
3. The battery holder automatically secures the battery in the proper position.
4. Replace the workstation cover or access panel.
5. Plug in the workstation and turn on power to the workstation.
6. Reset the date and time, your passwords, and any special system setups, using Computer Setup.

## 5.14.2 Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery.
2. When the battery pops up, lift it out.



3. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up. Push the other edge down until the clamp snaps over the other edge of the battery.



After the battery has been replaced, use the following steps to complete this procedure.

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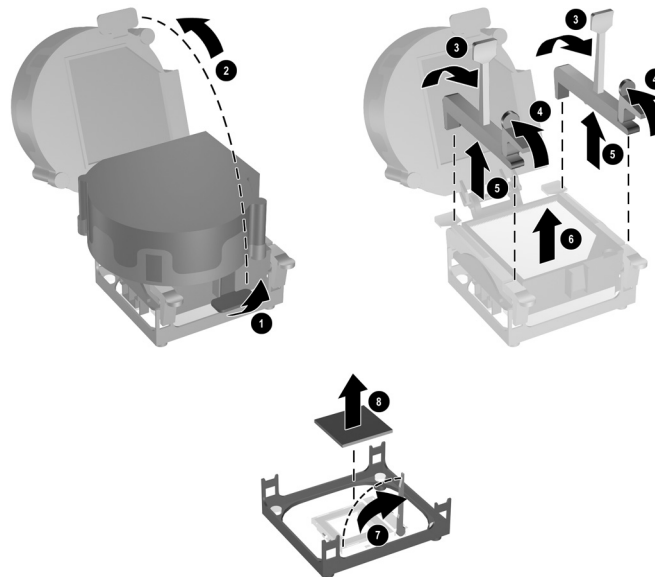
4. Replace the workstation cover or access panel.

5. Plug in the workstation and turn on power to the workstation.

Reset the date and time, your passwords, and any special system setups, using Computer Setup.

## 5.15 Processor and Heatsink

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Lift up the lever that secure the fan to the heatsink ❶ and rotate the fan up ❷.
4. Release the two latch locks ❸ and raise the legs that secure the latches to the base of heatsink mount ❹.
5. Tap the heatsink to check its temperature. If it is cool enough to handle, then proceed.
6. Twist the heatsink slightly to break the bond between it and the processor, then lift the heatsink from the processor ❺.
7. Rotate the ZIF socket handle to its fully open position ❻ and remove the processor from the socket ❼.



To install the processor and heatsink:

1. Insert the processor into the ZIF socket.
2. Press down on the processor while rotating and locking the ZIF socket handle in place.
3. Refresh the thermal grease between the heatsink and processor if necessary.
4. Install the heatsink and latch it in place.
5. Connect the heatsink fan control to the system board.
6. Replace the access panel and reconnect the workstation.

## 5.16 Speaker

Sound power level		LWAd (B)
Operation:	Hard Drive/48X CD-ROM	4.2/5.4 Bels
Stand-by/Idle:		3.9 Bels
Sound pressure level		dB
Operation:	Hard Drive/48X CD-ROM	29/44 dBA
Stand-by/Idle:		26 dBA

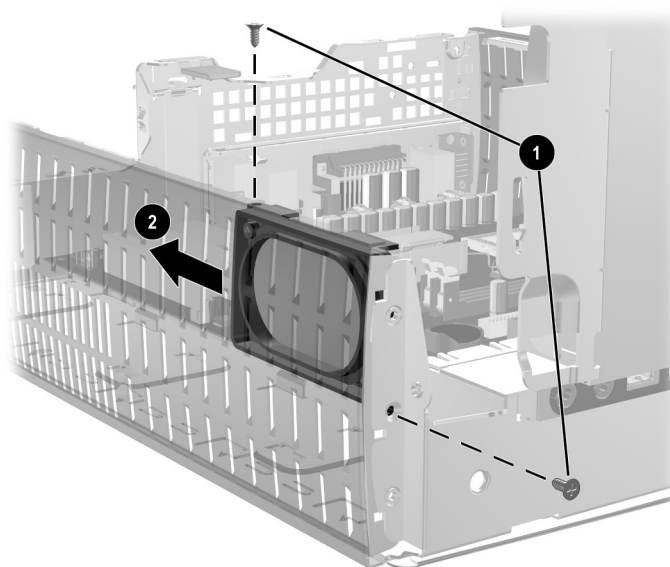
To install the speaker:

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Rotate the drive cage to its upright position.
4. Remove the expansion card cage (Section 5.9).
5. Disconnect the speaker wire from the system board.
6. Carefully cut the cable tie that secures the speaker cable to the power supply cable bundle.



**CAUTION:** Be careful when cutting the cable tie not to cut any cables.

7. Remove the power supply from the chassis (Section 5.17).
8. Remove the two screws that secure the speaker to the chassis.
9. Slide the speaker towards the rear of the chassis and down to remove it.



To install the speaker, reverse the removal procedures.

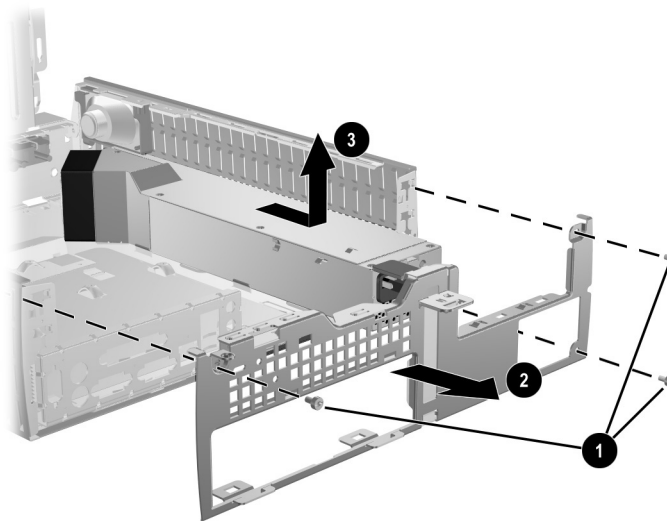


## 5.17 Power Supply



**WARNING:** Voltage is always present on the system board when the workstation is plugged into an active AC outlet. To avoid possible personal injury and damage to the equipment the power cord should be disconnected from the workstation and/or the AC outlet before opening the workstation.

1. Prepare the workstation for disassembly (Section 5.1).
2. Remove the workstation access panel (Section 5.5).
3. Rotate the drive cage to its upright position.
4. Remove the expansion card cage (Section 5.9).
5. Carefully cut the cable tie that secures the power supply cable bundle to the power switch cable, the speaker cable, and the front I/O cable.
6. Disconnect all power cables from the mass storage devices and from the system board.
7. Remove the three screws that secure the rear chassis panel to the chassis ❶, then pull the rear chassis panel straight back ❷ to remove it from the chassis.
8. Slide the power supply out the back of the workstation ❸.




To install the power supply, reverse the removal procedure.




## Connector Pin Assignments


### Enhanced Keyboard

Connector and Icon	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused


### Mouse

Connector and Icon	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused

### Ethernet BNC

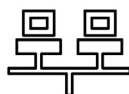
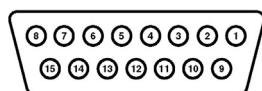
Connector and Icon	Pin	Signal
	1 (Center)	Data
	2 (Shield)	Ground

### Ethernet RJ-45

Connector and Icon	Pin	Signal
	1	(+) Transmit Data
	2	(-) Transmit Data
	3	(+) Receive Data
	4	Unused
	5	Unused
	6	(-) Receive Data
	7	Unused
	8	Unused

## Ethernet AUI

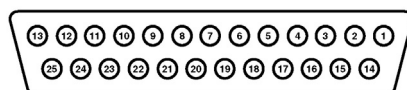
### Connector and Icon



Pin	Signal	Pin	Signal
1	Ground	9	Positive AUI Differential Receive
2	Negative AUI Differential Collision	10	+12V
3	Positive AUI Differential Collision	11	Ground
4	Negative AUI Differential Transmit	12	Ground
5	Positive AUI Differential Transmit	13	Unused
6	Ground	14	Unused
7	Ground	15	Unused
8	Negative AUI Differential Receive	16	Unused

## Parallel Interface

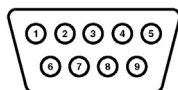
### Connector and Icon



Pin	Signal	Pin	Signal	Pin	Signal
1	Strobe	7	Data Bit 5	13	Select
2	Data Bit 0	8	Data Bit 6	14	Auto Linefeed
3	Data Bit 1	9	Data Bit 7	15	Error
4	Data Bit 2	10	Acknowledge	16	Initialize Printer
5	Data Bit 3	11	Busy	17	Select IN
6	Data Bit 4	12	Paper End	18-25	Signal Ground

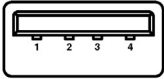

## Serial Interface

### Connector and Icon





Pin	Signal
1	Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator



**USB**

Connector and Icon	Pin	Signal
 	1	+5 VDC
	2	- Data
	3	+ Data
	4	Ground

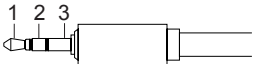

**Microphone**

Connector and Icon (1/8" miniphone)	Pin	Signal
 	1 (Tip)	Audio
	2 (Ring)	Power
	3 (Shield)	Ground



**Headphone**

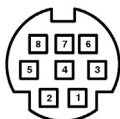
Connector and Icon (1/8" miniphone)	Pin	Signal
 	1 (Tip)	Audio_Left
	2 (Ring)	Audio_Right
	3 (Shield)	Ground

**Line-In Audio**

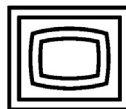
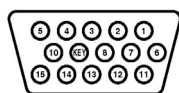
Connector and Icon (1/8" miniphone)	Pin	Signal
 	1 (Tip)	Audio_In_Left
	2 (Ring)	Audio_In_Right
	3 (Shield)	Ground

**Line-Out Audio**

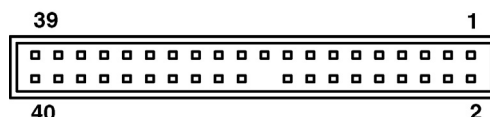
Connector and Icon (1/8" miniphone)	Pin	Signal
 	1 (Tip)	Audio_Out_Left
	2 (Ring)	Audio_Out_Right
	3 (Shield)	Ground

**External Infrared Transceiver****Connector and Icon**

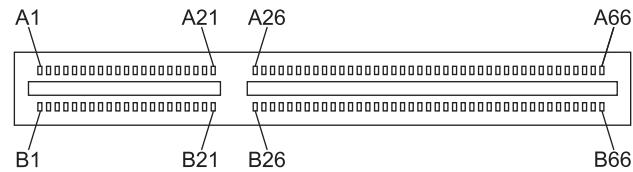
Pin	Signal	Pin	Signal	Pin	Signal
1	Transmit	4	5V	7	Not Used
2	Receive	5	Mode	8	Not Used
3	Ground	6	Not Used		

**Monitor****Connector and Icon**

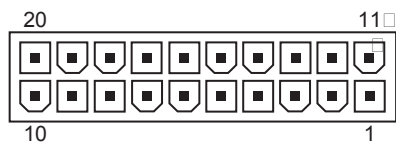
Pin	Signal	Pin	Signal	Pin	Signal
1	Red Analog	6	Ground	11	Monitor ID
2	Green Analog	7	Ground	12	DDC Serial Data
3	Blue Analog	8	Ground	13	Horizontal Sync
4	Not used	9	+5V (fused)	14	Vertical Sync
5	Ground	10	Ground	15	DDC Serial Clock

**ATA/ATAPI (IDE) Standard Drive Cable****Connector**

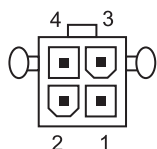
Pin	Signal	Pin	Signal	Pin	Signal
1	Reset	15	DD1	29	DMAK
2	Ground	16	DD14	30	Ground
3	DD7	17	DD0	31	INTRQ
4	DD8	18	DD15	32	IOCS16
5	DD6	19	Ground	33	DA1
6	DD9	20	(Key)	34	PDIAG (cable detect)
7	DD5	21	DMARQ	35	DA0
8	DD10	22	Ground	36	DA2
9	DD4	23	DIOW	37	CS1FX
10	DD11	24	Ground	38	CS3FX
11	DD3	25	DIOR	39	DASP
12	DD12	26	Ground	40	Ground
13	DD2	27	IORDY		
14	DD13	28	CSEL		

**Accelerated Graphics Port (AGP)****Connector**

Pin	Signal A	Signal B	Pin	Signal A	Signal B
1	+12 V	OVRcnt#	34	Vddq	Vddq
2	TYPEDET#	+ 5V	35	AD22	AD21
3	Reserved	+ 5V	36	AD20	AD19
4	USB-	USB+	37	Ground	Ground
5	Ground	Ground	38	AD18	AD17
6	INTA#	INTB#	39	AD16	C/BE2#
7	RST#	CLK	40	Vddq	Vddq
8	GNT#	REQ#	41	FRAME#	IRDY#
9	VCC3.3	VCC3.3	42	Reserved	3.3VAux
10	ST1	ST0	43	Ground	Ground
11	Reserved	ST2	44	Reserved	Reserved
12	PIPE#	RBF#	45	VCC 3.3	VCC 3.3
13	Ground	Ground	46	TRDY#	DEVSEL#
14	WBF#	Reserved	47	STOP#	Vddq
15	SBA1	SBA0	48	PME#	PERR#
16	VCC 3.3	VCC 3.3	49	Ground	Ground
17	SBA3	SBA2	50	PAR	SERR#
18	SB_STB#	SB_STB	51	AD15	C/BE1#
19	Ground	Ground	52	Vddq	Vddq
20	SBA5	SBA4	53	AD13	AD14
21	SBA7	SBA6	54	AD11	AD12
22	Reserved	Reserved	55	Ground	Ground
23	Ground	Ground	56	AD9	AD10
24	Reserved	3.3 Vaux	57	C/BE0#	AD8
25	VCC 3.3	VCC 3.3	58	Vddq	Vddq
26	AD30	AD31	59	AD_STB0#	AD_STB0
27	AD28	AD29	60	AD6	AD7
28	VCC 3.3	VCC 3.3	61	Ground	Ground
29	AD26	AD27	62	AD4	AD5
30	AD24	AD25	63	AD2	AD3
31	Ground	Ground	64	Vddq	Vddq
32	AD_STB1#	AD_STB1	65	AD0	AD1
33	C/BE3#	AD23	66	VREFGC	VREFCG

**20-Pin Power****Connector**

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+3.3 V	6	+5 V	11	+3.3 V	16	GND
2	+3.3 V	7	GND	12	-12 V	17	GND
3	GND	8	POK	13	GND	18	-5 V
4	+5 V	9	+5 V <sub>aux</sub>	14	PSON	19	+5 V
5	GND	10	+12 V	15	GND	20	+5 V

**4-Pin Power (for CPU)****Connector and Icon****Pin****Signal**

1	GND
2	GND
3	+12 V
4	-12 V



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## **Power Cord Set Requirements**

The voltage select switch feature on the workstation permits it to operate from any line voltage between 100-120 or 220-240 volts AC.

The power cord set received with the workstation meets the requirements for use in the country where you purchased the equipment.

Power cord sets for use in other countries must meet the requirements of the country where you use the workstation. For more information on power cord set requirements, contact your authorized HP dealer, reseller, or service provider.

### **General Requirements**

The requirements listed below are applicable to all countries:

1. The length of the power cord set must be at least 6.00 feet (1.8 m) and a maximum of 9.75 feet (3.0 m).
2. All power cord sets must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be used.
3. The power cord set must have a minimum current capacity of 10A and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.
4. The appliance coupler must meet the mechanical configuration of an EN 60 320/IEC 320 Standard Sheet C13 connector, for mating with appliance inlet on the Switch Box.

## Country-Specific Requirements

Additional requirements specific to a country are shown in parentheses and explained below.

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO
Canada (2)	CSA	Sweden (1)	SEMKO
Denmark (1)	DEMKO	Switzerland (1)	SEV
Finland (1)	SETI	United Kingdom (1)	BSI
France (1)	UTE	United States (2)	UL
Germany (1)	VDE		

1. The flexible cord must be <HAR> Type HO5VV-F, 3-conductor, 1.0 mm<sup>2</sup> conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.
2. The flexible cord must be Type SJT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A 250V) configuration.
3. Appliance coupler, flexible cord, and wall plug must bear a "T" mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 1.0 mm<sup>2</sup> conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

## POST Error Messages

An error message results if the Power-On Self-Test (POST) encounters a problem. This test runs when the system is turned on, checking assemblies within the workstation and reporting any errors found.

Some workstations do not use all of the codes listed.

### POST Error Messages

Screen Message	Probable Cause	Recommended Action
101-Option ROM Error	System ROM checksum.	Verify the correct ROM. Flash the ROM if needed. If an expansion card was recently added, remove it and see if the problem remains. Clear CMOS. If the message disappears, there may be a problem with the expansion card. Replace the system board.
102-System Board Failure	DMA, timers, etc.	Clear CMOS. Remove expansion boards. Replace the system board.
103-System Board Failure	DMA, timers, etc.	Clear CMOS. Remove expansion boards. Replace the system board.
150-SafePost Active	A PCI expansion card is not responding.	Restart the workstation. Disable SafePost. If the expansion card does not respond, replace the card.
162-System Options Not Set	Configuration incorrect. RTC (real-time clock) battery may need to be replaced.	Run Computer Setup (F10 Setup). Set the date and time under <b>Control Panel</b> or in F10 Setup depending on the operating system. If the problem persists, replace the RTC battery.

**POST Error Messages**

<b>Screen Message</b>	<b>Probable Cause</b>	<b>Recommended Action</b>
163-Time & Date Not Set	Invalid time or date in configuration memory. RTC (real-time clock) battery may need to be replaced. CMOS jumper may not be properly installed.	Set the date and time under <b>Control Panel</b> or in F10 Setup depending on the operating system. If the problem persists, replace the RTC battery.
164-Memory Size Error	Memory configuration is incorrect.	Run Computer Setup (F10 Setup) or Windows utilities. Make sure memory module(s) (if any) are installed properly. If third party memory has been added, test using HP-only memory. Verify proper memory module type.
183-Invalid Processor Jumper Setting	System board jumper improperly set.	Reset system board jumpers to match processor and bus speeds (select models).
201-Memory Error	RAM failure.	Run Computer Setup (F10 Setup) or Windows utilities. Ensure memory and continuity modules are installed correctly. Verify proper memory module type. Remove and replace memory module(s) one at a time to isolate faulty module. Replace the faulty memory module(s). If error persists after replacing memory modules, replace the system board.
202-Memory Type Mismatch	Memory modules do not match each other.	Replace memory modules with matched sets.
207-ECC Corrected Single Bit Errors in Memory Socket(s) y,y	Single Bit ECC error.	Verify proper memory module type. Try another memory socket. Replace memory module if problem persists.
212-Failed Processor	Processor has failed to initialize.	Reseat the processor in its socket. If the processor does not respond, replace it.
213-Incompatible memory Module in memory Socket(s) X,X, X	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	Verify proper memory module type. Try another memory socket. Replace memory with a module conforming to the SPD standard.

**POST Error Messages**

<b>Screen Message</b>	<b>Probable Cause</b>	<b>Recommended Action</b>
214-DIMM Configuration Warning	Populated DIMM Configuration is unbalanced.	2 DIMMS - For maximum performance, place both DIMMs in the two BLACK DIMM slots. 4 DIMMS - For maximum performance, swap one DIMM in a BLUE slot with one in a BLACK slot.
301-Keyboard Error	Keyboard failure.	Reconnect keyboard with workstation turned off. Check connector for bent or missing pins. Ensure that none of the keys are depressed. Replace keyboard.
303-Keyboard Controller Error	I/O board keyboard controller.	Reconnect keyboard with workstation turned off. Replace the system board.
304-Keyboard or System Unit Error	Keyboard failure.	Reconnect the keyboard with workstation turned off. Ensure that none of the keys are depressed. Replace keyboard. Replace system board.
401-Parallel Port 1 Address Assignment Conflict	IRQ address conflicts with another device.	Reset the IRQ.
402-Parallel Port 2 Address Assignment Conflict	IRQ address conflicts with another device.	Reset the IRQ.
403-Parallel Port 3 Address Assignment Conflict	IRQ address conflicts with another device.	Reset the IRQ.
404-Parallel Port Address Conflict Detected	Both external and internal ports are assigned to parallel port X.	Remove any parallel expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup (F10 Setup).
410-Audio Interrupt Conflict	IRQ address conflicts with another device.	Reset the IRQ.
411-Network Interface Card Interrupt Conflict	IRQ address conflicts with another device.	Reset the IRQ.
417-Network Interface card Failure	Failure to read MAC address information from NIC.	Unplug AC power cord, wait 5 seconds, then reboot unit.

**POST Error Messages**

<b>Screen Message</b>	<b>Probable Cause</b>	<b>Recommended Action</b>
501-Display Adapter Failure	Graphics display controller.	Reseat the graphics card (if applicable). Clear CMOS. Verify that the monitor is attached and turned on. Replace the graphics controller.
510-Splash Screen image corrupted	Splash Screen image has errors.	Install latest version of ROMPaq to restore image.
511-CPU, CPUA, or CPUB Fan not detected	Fan is not connected or may have malfunctioned.	Reseat fan cable. Reseat the fan. Replace the fan.
512-Chassis, rear chassis, or front chassis fan not detected	Fan is not connected, may have malfunctioned.	Reseat chassis, rear chassis, or front chassis fan cable. Reseat chassis, rear chassis, or front chassis fan. Replace chassis, rear chassis, or front chassis fan.
514-CPU or Chassis Fan not detected.	CPU fan is not connected or may have malfunctioned.	Reseat CPU or chassis fan. Replace CPU or chassis fan.
520-Single Monitor Configuration warning	Single monitor configuration with monitor attached to video port 2.	Turn off unit, attach monitor to video port 1, then restart unit.
601-Diskette Controller Error	Diskette controller circuitry or floppy drive circuitry incorrect.	Run Computer Setup (F10 Setup). Check and/or replace cables. Clear CMOS. Replace diskette drive. Replace the system board.
602-Diskette Boot Record Error	Diskette in drive A not bootable.	Replace the diskette.
605-Diskette Drive Type Error	Mismatch in drive type.	Run Computer Setup (F10 Setup). Disconnect any other diskette controller devices (tape drives). Clear CMOS.
610-External Storage Device Failure	External tape drive not connected.	Reinstall tape drive or press <b>F1</b> and allow system to reconfigure without the drive.
611-Primary Floppy Port Address Assignment Conflict	Configuration error.	Run Computer Setup (F10 Setup). Remove expansion cards. Clear CMOS.

**POST Error Messages**

<b>Screen Message</b>	<b>Probable Cause</b>	<b>Recommended Action</b>
660-Display Cache is Detected Unreliable	Integrated video controller display cache not working properly and will be disabled.	Replace system board if minimal video degrading is an issue.
912-Computer Cover Has Been Removed Since Last System Start Up		No action required.
914-Hood Lock Coil is not Connected	Smart cover lock mechanism is missing or not connected.	Reconnect or replace hood locking mechanism. Reseat or replace hood locking mechanism cable.
916-Power Button not Connected	Power button cable not connected.	Connect power button cable.
917-Front Audio not Connected	Front audio cable not connected.	Connect the front audio cable.
919-Front Panel, MultiPort, and/or MultiBay Risers not Detected.	Riser card has been removed or has not been reinstalled properly in the system.	Unplug workstation and install/reinstall riser cord.
1151-Serial Port 1 Address Conflict Detected	Both external and internal serial ports are assigned to COM1.	Remove any Comm port expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup (F10 Setup). Run Computer Setup or Windows utilities.
1152-Serial Port 2 Address Conflict Detected	Both external and internal serial ports are assigned to COM2.	Remove any Comm port expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup (F10 Setup). Run Computer Setup or Windows utilities.
1155-Serial Port Address Conflict Detected	Both external and internal serial ports are assigned to same IRQ.	Remove any Comm port expansion cards. Clear CMOS. Reconfigure card resources and/or run Computer Setup (F10 Setup).Run Computer Setup or Windows utilities.
1156-Serial Port A Cable Not Detected	Serial Port cable assembly disconnected from system board.	Turn off unit, disconnect the power cable from the power source, open the workstation chassis and attach serial port cable to the system board.

**POST Error Messages**

<b>Screen Message</b>	<b>Probable Cause</b>	<b>Recommended Action</b>
1157-Front Cables Not Detected	Front cable assembly (audio and USB) disconnected from the system board.	Turn off unit, disconnect the power cable from the power source, open the workstation chassis and attach front cable assembly to the system board.
1201-System Audio Address Conflict Detected	Device IRQ address conflicts with another device.	Reset the IRQ.
1202-MIDI Port Address Conflict Detected	Device IRQ address conflicts with another device.	Reset the IRQ.
1203-Game Port Address Conflict Detected	Device IRQ address conflicts with another device.	Reset the IRQ.
1720 SMART Hard Drive Detect Imminent Failure	Hard drive is about to fail. (Some hard drives have a firmware patch that will fix an erroneous error message.)	Determine if hard drive is giving correct error message. Run the Drive Protection System text if applicable. Apply firmware patch if applicable. (see <a href="http://www.hp.com/support">www.hp.com/support</a> ) Back up contents and replace hard drive.
1794-Inaccessible devices attached to primary IDE controller	Devices attached to the primary IDE (Parallel ATA) controller are inaccessible while "SATA Configuration" is set to "Replace Primary IDE Controller" in Computer Setup.	If you do not require access to SATA devices, or if you are using Windows 2000 or Windows XP, enter the devices attached to the primary IDE (Parallel ATA) channel.
1800-Temperature Alert	Internal temperature exceeds specification.	Check that workstation air vents are not blocked and cooling fan is running. Verify processor speed selection. Replace the processor. Replace the system board.
1801-Microcode Patch Error	Processor not supported by ROM BIOS.	Upgrade BIOS to proper version.
1998-Master Boot Record has been lost.	The previously saved copy of the MBR has been corrupted.	Run Computer Setup and save the MBR of the current bootable disk.



## POST Error Messages

Screen Message	Probable Cause	Recommended Action
1998-Master Boot Record has been changed.	The current MBR does not match the previously saved copy of the MBR.	Use extreme caution, The MBR may have been updated due to normal disk maintenance activities (disk manager, fdisk, or format). Replacing the previously saved MBR in such situations can cause data loss. If certain that the MBR change is unintentional and undesired (e.g. due to a virus), run Computer Setup and restore the previously saved MBR copy. Otherwise, run Computer Setup and either disable MBR security or save the MBR of the current bootable disk.
2000-Master Boot Record Hard Drive has Changed.	The current bootable hard drive is not the same as the one that was present when MBR security was enabled.	Run Computer Setup and either disable MBR security or save the MBR of the current bootable disk.
Invalid Electronic Serial Number.	Electronic serial number has become corrupted.	Run Computer Setup. If Setup already has data in the field or will not allow the serial number to be entered, download from <a href="http://www.hp.com">http://www.hp.com</a> and run SP5572.EXE (SNZERO.EXE). Run Computer Setup and try to enter serial number under Security, System ID, then save changes.
ECC Multiple Bit Error Detected in Memory Module.	Chipset has detected more than one bad bit in a 64-bit quadword of the memory array.	Replace the memory module.
Parity Check 2.	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.



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# Troubleshooting Without Diagnostics

## E-Support

For online access to technical support information and tools, go to [www.hp.com/support](http://www.hp.com/support). Support resources include web-based troubleshooting tools, technical knowledge databases, driver and path downloads, online communities, and proactive notification services.


## Troubleshooting Checklist

This section describes some simple, preliminary tests and guidelines for troubleshooting the workstation without using the diagnostics.

- Are the workstation and monitor connected to a working electrical outlet?
- Is the voltage select switch is set to the appropriate voltage for your region (115V or 230V)?
- Is the workstation turned on?
- Is the green power light illuminated?
- Is the monitor turned on?
- Is the green monitor light illuminated?
- Turn up the monitor brightness and contrast controls if the monitor is dim.
- If the system has multiple video sources (embedded, PCI, or AGP adapters) installed (embedded video on select models only) and a single monitor, the monitor must be plugged into the monitor connector on the source selected as the primary VGA adapter. During boot, the other monitor connectors are disabled and if the monitor is connected into these ports, the monitor will not function. You can select which source will be the default VGA source in Computer (F10) Setup.
- Press and hold any key. If the system beeps, then the keyboard is operating correctly.
- Check all cables for loose or incorrect connections.
- Reconfigure the workstation after installing a non–Plug and Play expansion board or other option, such as a diskette drive.
- Are all of the necessary device drivers installed?
- Have all printer drivers been installed for each application?
- Remove all diskettes from the diskette drives before you turn on the system.
- Are all switches set correctly?
- Is the NIC Remote Wakeup cable (featured on some models) connected between the NIC and the riser/system board?

# Solving Minor Problems

## Solving Minor Problems

Problem	Cause	Possible Solution
Workstation appears locked up and will not turn off when the power button is pressed.	Software control of the power switch is not functional.	<ol style="list-style-type: none"> <li>1. Press and hold the power button for at least four seconds until the workstation turns off.</li> <li>2. Disconnect electrical plug from outlet.</li> </ol>
Workstation will not respond to USB keyboard or mouse.	Workstation is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.
 <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the workstation will shut down and you will lose your data.		
Workstation date and time display is incorrect.	RTC (real-time clock) battery may need to be replaced.	<ol style="list-style-type: none"> <li>1. Reset the date and time under <b>Control Panel</b>.</li> <li>2. Replace the RTC battery.</li> </ol>
Workstation appears to pause periodically.	Network driver is loaded and no network connection is established.	Establish a network connection, or use Computer Setup or Microsoft Windows Device Manager to disable the network controller.
Cursor will not move using the arrow keys on the keypad.	The <b>Num Lock</b> key may be on.	Press the <b>Num Lock</b> key. The <b>Num Lock</b> key can be disabled (or enabled) in Computer Setup.
Cannot remove workstation cover or access panel.	Smart Cover Lock, featured on some workstations, is locked.	<ol style="list-style-type: none"> <li>1. Unlock the Smart Cover Lock using Computer Setup.</li> <li>2. Use the Smart Cover FailSafe Key in case of forgotten password, power loss, or workstation malfunction.</li> </ol>
Poor performance is experienced.	Processor is hot.	<ol style="list-style-type: none"> <li>1. Ensure airflow to the workstation is not blocked.</li> <li>2. Ensure the fans are connected and working properly (some fans only operate when needed).</li> <li>3. Ensure the processor heatsink is installed properly.</li> </ol>
	Hard drive is full.	Transfer data from the hard drive to create more space on the hard drive.

## Solving Minor Problems (Continued)

Problem	Cause	Possible Solution
Workstation powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause.	Processor thermal protection activated: A fan may be blocked or not turning. OR The heatsink is not properly attached to the processor.	<ol style="list-style-type: none"> <li>1. Ensure workstation air vents are not blocked and the cooling fan is running.</li> <li>2. Open hood, press power button, and see if the processor fan spins. If not spinning, make sure the fan's cable is plugged onto the system board header. Ensure the fan is fully/properly seated or installed.</li> <li>3. Replace the processor fan.</li> <li>4. Reseat processor heatsink and verify that the fan assembly is properly attached.</li> </ol>
System does not power on and the LEDs on the front of the workstation are not flashing.	System unable to power on.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then:</p> <ol style="list-style-type: none"> <li>1. Check that the voltage selector is set to the appropriate voltage.</li> <li>2. Remove the expansion cards one at a time until the 3.3 V<sub>aux</sub> light on the system board turns on.</li> <li>3. Replace the system board.</li> </ol> <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:</p> <ol style="list-style-type: none"> <li>1. Check that the unit is plugged into a working AC outlet.</li> <li>2. Open hood and check that the power button harness is properly connected to the system board.</li> <li>3. Check that both power supply cables are properly connected to the system board.</li> <li>4. If the 3.3 V<sub>aux</sub> light on the system board is on, then replace the power button harness.</li> <li>5. If the 3.3 V<sub>aux</sub> light on the system board is off, then replace the power supply.</li> <li>6. Replace the system board.</li> </ol>

# Solving Power Supply Problems

## Solving Power Supply Problems

Problem	Cause	Solution
Power supply shuts down intermittently.	Voltage selector switch on rear of workstation chassis not switched to correct line voltage.	Select the proper AC voltage.
	Power supply fault.	Replace the power supply.
Workstation powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause.	Processor thermal protection activated: A fan may be blocked or not turning. OR The heatsink/fan assembly is not properly attached to the processor.	<ol style="list-style-type: none"> <li>1. Ensure that the workstation air vents are not blocked and the cooling fan is running.</li> <li>2. Open hood, press the power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header. Ensure the fan is fully/properly seated or installed.</li> <li>3. Replace the processor fan.</li> <li>4. Reseat processor heatsink and verify that the fan assembly is properly attached.</li> </ol>
Power LED flashes Red, once every two seconds.	Power failure (power supply is overloaded).	<ol style="list-style-type: none"> <li>1. Check that the voltage selector, is set to the appropriate voltage.</li> <li>2. Open the hood and ensure the 4-wire power supply cable is seated into the connector on the system board.</li> <li>3. Check if a device is causing the problem by removing ALL attached devices). Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly.</li> <li>4. Replace the power supply.</li> <li>5. Replace the system board.</li> </ol>

# Solving Diskette Problems

## Solving Diskette Problems

Problem	Cause	Solution
Diskette drive light stays on.	Diskette is damaged.	In Microsoft Windows 2000 and Microsoft Windows XP, right-click <b>Start</b> , click <b>Explore</b> , and select a drive. Select <b>File &gt; Properties &gt; Tools</b> . Under <b>Error-checking</b> , click <b>Check Now</b> .
	Diskette is incorrectly inserted.	Remove diskette and reinsert.
	Drive button is not pushed in.	Push in drive button.
	Files on diskette are damaged.	Check the program diskettes.
Drive not found.	Drive cable is not properly connected.	Reconnect power cable. Ensure that all four pins are connected.
	Cable is loose.	Reseat diskette drive data and power cables.
Diskette drive cannot write to a diskette.	Removable drive is not seated properly.	Reseat the drive.
	Diskette is not formatted.	Format the diskette.
	Diskette is write-protected.	Use another diskette or remove the write protection.
	Writing to the wrong drive.	Check the drive letter in the path statement.
	Not enough space is left on the diskette.	Use another diskette.
	Diskette write control is enabled.	Use Computer Setup to check the storage security feature disabled settings.
Cannot format diskette.	Diskette is damaged.	Replace the damaged disk.
	Invalid media reported.	When formatting a disk in MS-DOS, you may need to specify diskette capacity. For example, to format a 1.44-MB diskette, type the following command at the MS-DOS prompt: <b>FORMAT A: /F:1440</b>
A problem has occurred with a disk transaction.	The directory structure is bad, or there is a problem with a file.	In Windows 2000 and Windows XP, right-click <b>Start</b> , click <b>Explore</b> , and select a drive. <b>Select File &gt; Properties &gt; Tools</b> . Under <b>Error-checking</b> , click <b>Check Now</b> .

## Solving Diskette Problems (Continued)

Problem	Cause	Solution
Diskette drive cannot read a diskette.	Diskette is not formatted.	Format the diskette.
	You are using the wrong diskette type for the drive type.	Check the type of drive that you are using and use the correct diskette type.
	You are reading the wrong drive.	Check the drive letter in the path statement.
	Diskette is damaged.	Replace the diskette with a new one.
"Invalid system disk" message is displayed.	A diskette that does not contain the system files needed to start the workstation has been inserted in the drive.	When drive activity stops, remove the diskette and press the <b>Spacebar</b> . The workstation should start up.
	Diskette error has occurred.	Restart the workstation by pressing the power button.
Cannot Boot to Diskette.	Diskette is not bootable.	Replace with a bootable diskette.
	Diskette boot has been disabled in Computer Setup.	Run Computer Setup and enable diskette boot in <b>Storage &gt; Boot Order</b> .
	Removable media boot has been disabled in Computer Setup.	Run Computer Setup and enable Removable Media Boot in <b>Storage &gt; Storage Options</b> .
	Diskette MBR validation is enabled.	Run Computer Setup and disable Diskette MBR Validation in <b>Storage &gt; Storage Options</b> .

## Solving Hard Drive Problems

### Solving Hard Drive Problems

Problem	Cause	Solution
Hard drive error occurs.	Hard disk has bad sectors or has failed.	Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.
Disk transaction problem.	Either the directory structure is bad or there is a problem with a file.	In Windows 2000 and Windows XP, right-click <b>Start</b> , click <b>Explore</b> , and select a drive. Select <b>File &gt; Properties &gt; Tools</b> . Under <b>Error-checking</b> , click <b>Check Now</b> .
Drive not found (identified).	Loose cable.	Check cable connections.




## Solving Hard Drive Problems (Continued)

Problem	Cause	Solution
	The system may not have automatically recognized a newly installed device.	<ol style="list-style-type: none"> <li>1. Run Computer Setup.</li> <li>2. If the system still does not recognize the new device, check to see if the device is listed within Computer Setup. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem.</li> <li>3. If this is a newly installed drive, enter Setup and try adding a POST delay under <b>Advanced &gt; Power-On</b>.</li> </ol>
	Drive jumper settings may be incorrect.	If the drive is a secondary drive that has just been installed on the same cable as the primary drive, verify that the jumpers for both drives are set correctly.
	Drive's IDE (ATA) controller is disabled in Computer Setup.	Run Computer Setup and enable the Primary and Secondary IDE (ATA) controllers in <b>Storage &gt; Storage Options</b> .
	Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in <b>Advanced &gt; Power-On Options</b> .
Nonsystem disk/NTLDR missing message.	System is trying to start from a non bootable diskette.	Remove the diskette from the diskette drive.
Nonsystem disk/NTLDR missing message. (continued)	System is trying to start from a damaged hard drive.	<ol style="list-style-type: none"> <li>1. Insert a bootable diskette into the diskette drive and restart the workstation.</li> <li>2. If the hard drive is still inaccessible and MBR Security is enabled, try restoring the previously saved MBR image by entering Setup and selecting <b>Security &gt; Restore Master Boot Record</b>.</li> </ol>
	System files missing or not properly installed.	<ol style="list-style-type: none"> <li>1. Insert a bootable system diskette and restart.</li> <li>2. Verify hard drive is partitioned and formatted.</li> <li>3. Install system files for the appropriate operating system if necessary.</li> </ol>

## Solving Hard Drive Problems *(Continued)*

Problem	Cause	Solution
	Hard drive boot disabled in Computer Setup.	Run Computer Setup and enable the hard drive entry in the <b>Storage &gt; Boot Order</b> list.
Second Ultra ATA hard drive does not perform optimally.	Using the wrong cable for the drive type.	Reinstall the second Ultra ATA hard drive using an 80-conductor cable (standard on select models.)
	Both slow and fast UATA devices are on the same data cable.	Connect slower UATA devices to a separate data cable connected to the secondary IDE (ATA) controller.
Workstation will not start.	Hard drive is damaged.	Observe the beeps and LED lights on the front of the workstation. See Appendix C "POST Error Messages".
Workstation seems to be locked up.	Program in use has stopped responding to commands.	<ol style="list-style-type: none"> <li>1. Attempt the normal Windows "Shut Down" procedure.</li> <li>2. Press the power button for four or more seconds to turn off the power.</li> <li>3. Restart the workstation using the power button.</li> </ol>

# Solving Display Problems

Solving Display Problems		
Problem	Cause	Solution
Blank screen (no video).	The cable connections are not correct.	Check the cable connections from the monitor to the workstation and to the electrical outlet.
	Screen blanking utility installed or energy saver features enabled.	Press any key or click the mouse button and, if set, type your password.
	System ROM is bad; system is running in FailSafe Boot Block mode (indicated by eight beeps).	Reflash the ROM using a ROMPaq diskette.
	Fixed-sync monitor will not sync at the resolution chosen.	Ensure that the monitor can accept the same horizontal scan rate as the resolution chosen.
	Workstation is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.
 <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the workstation will shut down and you will lose your data.		
	Monitor cable plugged into the wrong connector.	If the workstation system has both an integrated graphics connector and an AGP card connector, plug the monitor cable into the AGP card connector.
	Monitor settings in the workstation are not compatible with the monitor.	<ol style="list-style-type: none"> <li>1. Restart the workstation and press <b>F8</b> during startup when you see "Press F8" in the bottom right corner of the screen.</li> <li>2. Using the keyboard arrow keys, select <b>Enable VGA Mode</b> and press <b>Enter</b>.</li> <li>3. In Windows Control Panel, double-click the <b>Display</b> icon and select the <b>Settings</b> tab.</li> <li>4. Use the sliding control to reset the resolution.</li> </ol>

## Solving Display Problems (Continued)

Problem	Cause	Solution
Power LED flashes Red six times, once every second, followed by a two second pause, and the workstation beeps six times.	Pre-video graphics error.	For systems with a graphics card: <ol style="list-style-type: none"> <li>1. Reseat the graphics card.</li> <li>2. Replace the graphics card.</li> <li>3. Replace the system board.</li> </ol> For systems with integrated graphics, replace the system board.
Monitor does not function properly when used with energy saver features.	Monitor without energy saver capabilities is being used with energy saver features enabled.	Disable monitor energy saver feature.
Dim characters.	The brightness and contrast controls are not set properly.	Adjust the monitor brightness and contrast controls.
	Cables are not properly connected.	Check that the graphics cable is securely connected to the graphics card and the monitor.
Blurry video or requested resolution cannot be set.	If the graphics controller was upgraded, the correct video drivers may not be loaded.	Install the video drivers included in the upgrade kit.
	Monitor is not capable of displaying requested resolution.	Change requested resolution.
The picture is broken up, rolls, jitters, or flashes.	The monitor connections may be incomplete or the monitor may be incorrectly adjusted.	<ol style="list-style-type: none"> <li>1. Be sure the monitor cable is securely connected to the workstation.</li> <li>2. In a two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart.</li> <li>3. Fluorescent lights or fans may be too close to the monitor.</li> </ol>
	Monitor needs to be degaussed.	Degauss the monitor.
Vibrating or rattling noise coming from inside a CRT monitor when powered on.	Monitor degaussing coil has been activated.	None. It is normal for the degaussing coil to be activated when the monitor is powered on.
Clicking noise coming from inside a CRT monitor.	Electronic relays have been activated inside the monitor.	None. It is normal for some monitors to make a clicking noise when turned on and off, when going in and out of standby mode, and when changing resolutions.

## Solving Display Problems (Continued)

Problem	Cause	Solution
High pitched noise coming from inside a flat panel monitor.	Brightness and/or contrast settings are too high.	Lower brightness and/or contrast settings.
Fuzzy focus; streaking, ghosting, or shadowing effects; horizontal scrolling lines; faint vertical bars; or unable to center the picture on the screen. (flat panel monitors using an analog VGA input connection only)	Flat panel monitor's internal digital conversion circuits may be unable to correctly interpret the output synchronization of the graphics card.	<ol style="list-style-type: none"> <li>1. Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu.</li> <li>2. Manually synchronize the Clock and Clock Phase on-screen display functions. Download SoftPac SP20930 or SP22333, depending on the monitor, to assist with the synchronization.</li> </ol>
Certain typed symbols do not appear correct.	The font you are using does not support that particular symbol.	Use the Character Map to locate the and select the appropriate symbol. Click <b>Start &gt; All Programs &gt; Accessories &gt; System Tools &gt; Character Map</b> . You can copy the symbol from the Character Map into a document.

# Solving Audio Problems


## Solving Audio Problems

Problem	Cause	Solution
Sound does not come out of the speaker or headphones.	Software volume control is turned down.	Double-click the <b>Speaker</b> icon on the taskbar and use the volume slider to adjust the volume.
	The external speakers are not turned on.	Turn on the external speakers.
	External speakers plugged into the wrong audio jack.	See the sound card documentation for proper speaker connection.
	Audio cable not connected.	Connect audio cable between CD or DVD-ROM drive and the system board.
	Digital CD audio is not enabled.	Enable digital CD audio: <ol style="list-style-type: none"> <li>1. From the <b>Control Panel</b>, select <b>System</b>.</li> <li>2. On the <b>Hardware</b> tab, click the <b>Device Manager</b> button.</li> <li>3. Right-click on the CD/DVD device and select <b>Properties</b>.</li> <li>4. On the <b>Properties</b> tab, make sure "<b>Enable digital CD audio for this CD-ROM device</b>" is checked.</li> </ol>
	Headphones or devices connected to the line-out connector mute the internal speaker.	Turn on and use headphones or external speakers, if connected, or disconnect headphones or external speakers.
	Volume is muted.	<ol style="list-style-type: none"> <li>1. From the <b>Control Panel</b> program, click <b>Sound, Speech and Audio Devices</b>, then click <b>Sounds and Audio Devices</b>.</li> <li>2. Click the <b>Mute</b> check box to remove the check mark from the box.</li> </ol>
	Workstation is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.



**CAUTION:** When attempting to resume from **standby** mode, do not hold down the power button for more than four seconds. Otherwise, the workstation will shut down and you will lose your data.

## Solving Audio Problems (Continued)


Problem	Cause	Solution
Noise or no sound comes out of the speakers or headphones.		<ol style="list-style-type: none"> <li>1. If using digital speakers that have a stereo jack and want the system to auto-switch to digital, use a stereo-to-mono adapter to properly engage the auto-sense feature or use the multimedia device properties to manually switch the audio signal from analog to digital.</li> <li>2. If the headphones have a mono jack, use the multimedia device properties to switch the system to analog out.</li> </ol>
<p> If you set digital as the <b>Output Mode</b>, the internal speaker and external analog speakers will no longer output audio until you switch back to an auto-sense or analog mode.</p> <p>If you set analog as the <b>Output Mode</b>, external digital speakers will not function until you change the output mode back to an auto-sense or digital mode.</p>		
Sound cuts in and out.	Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.
Workstation appears to be locked up while recording audio.	The hard disk may be full.	<ol style="list-style-type: none"> <li>1. Before recording, make sure there is enough free space on the hard disk.</li> <li>2. Try recording the audio file in a compressed format.</li> </ol>

# Solving Printer Problems


Solving Printer Problems		
Problem	Cause	Solution
Printer will not print.	Printer is not turned on and online.	Turn the printer on and make sure it is online.
	The correct printer driver for the application are not installed.	<ol style="list-style-type: none"> <li>1. Install the correct printer driver for the application.</li> <li>2. Try printing using the MS-DOS command:  <b>DIR C:\ &gt; [printer port]</b>                      where <b>[printer port]</b> is the address of the printer being used. If the printer works, reload the printer driver.                 </li> </ol>
	If you are on a network, you may not have made the connection to the printer.	Make the proper network connections to the printer.
	Printer may have failed.	Run printer self-test.
Printer will not turn on.	The cables may not be connected properly.	Reconnect all cables.
Printer prints garbled information.	The correct printer driver is not installed.	Install the correct printer driver for the application.
	The cables may not be connected properly.	Reconnect all cables.
	Printer memory may be overloaded.	Reset the printer by turning it off for one minute, then turn it back on.
Printer is offline.	The printer may be out of paper.	1. Check the paper tray and refill it if it is empty.
		2. Select online.



# Solving Keyboard and Mouse Problems

Solving Keyboard Problems		
Problem	Cause	Solution
Keyboard commands and typing are not recognized by the workstation.	Keyboard connector is not properly connected.	<ol style="list-style-type: none"> <li>1. Turn off the workstation.</li> <li>2. Reconnect the keyboard to the back of the workstation and restart the workstation.</li> </ol>
	If the keyboard is connected to your workstation through a Keyboard, Video, and Mouse (KVM) switch, the mouse software applications might be interfering with the functionality of the keyboard.	You might need to uninstall the mouse software or connect the keyboard directly to the keyboard and connector on the workstation.
	Program in use has stopped responding to commands.	Shut down the workstation using the mouse and then restart the workstation.
	Keyboard needs repairs.	Replace the keyboard.
	Workstation is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.
 <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the workstation will shut down and you will lose your data.		
Cursor will not move using the arrow keys on the keypad.	The <b>Num Lock</b> key may be on.	Press the <b>Num Lock</b> key. The Num Lock light should not be on if you want to use the arrow keys. The <b>Num Lock</b> key can be disabled (or enabled) in Computer Setup.
Mouse does not respond to movement or is too slow.	Mouse connector is not properly plugged into the back of the workstation.	<ol style="list-style-type: none"> <li>1. Shut down the workstation using the keyboard.</li> <li>2. Plug the mouse connector into the back of the workstation (or the keyboard) and restart the workstation.</li> </ol>

## Solving Keyboard Problems

Problem	Cause	Solution
	If the mouse is connected to your workstation through a Keyboard, Video, and Mouse (KVM) switch, the mouse software applications might be interfering with the functionality of the mouse.	You might need to uninstall the mouse software or connect the mouse directly to the mouse connectors on the workstation.
	Program in use has stopped responding to commands.	Shut down the workstation using the keyboard and then restart the workstation.
	Mouse needs repairs.	Replace the mouse.
	Workstation is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.
 <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the workstation will shut down and you will lose your data.		
Mouse will only move vertically or horizontally, or movement is jerky.	Mouse roller ball is dirty.	Remove roller ball cover from the bottom of the mouse and clean it.

## Solving Hardware Installation Problems

You may need to reconfigure the workstation when you add or remove hardware, such as an additional diskette drive. If you install a plug and play device, Windows 2000 and Windows XP automatically recognize the device and configure the workstation. If you install a non-plug and play device, you must reconfigure the workstation after completing installation of the new hardware. In Windows 2000, select the **Add New Hardware** icon in the **Control Panel** (for Windows XP, use the **Add Hardware Wizard**) and follow the instructions that appear on the screen.

### Solving Hardware Installation Problems

Problem	Cause	Solution
A new device is not recognized as part of the system.	Device is not seated or connected properly.	Ensure that the device is properly and securely connected and that pins in the connector are not bent down.
	Cable(s) of new external device are loose or power cables are unplugged.	Ensure that all cables are properly and securely connected and that pins in the cable or connector are not bent down.


## Solving Hardware Installation Problems *(Continued)*

Problem	Cause	Solution
	Power switch of new external device is not turned on.	Turn off the workstation, turn on the external device, then turn on the workstation to integrate the device with the workstation system.
	When the system advised you of changes to the configuration, you did not accept them.	Reboot the workstation and follow the instructions for accepting the changes.
	A plug and play board may not automatically configure when added if the default configuration conflicts with other devices.	Use Windows 2000 or Windows XP Device Manager to deselect the automatic settings for the board and choose a basic configuration that does not cause a resource conflict. You can also use Computer Setup to reconfigure or disable devices to resolve the resource conflict.
Workstation will not start.	Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location.	<ol style="list-style-type: none"> <li>1. Review the documentation that came with the system to determine if you are using the correct memory modules and to verify the proper installation.</li> <li>2. Observe the beeps and LED lights on the front of the workstation. See Appendix C "POST Error Messages" to determine possible causes.</li> </ol>
Power LED flashes Red five times, once every second, followed by a two second pause, and the workstation beeps five times.	Memory is installed incorrectly or is bad.	<ol style="list-style-type: none"> <li>1. Reseat DIMMs.</li> <li>2. Replace DIMMs one at a time to isolate the faulty module.</li> <li>3. Replace third-party memory with HP memory.</li> <li>4. Replace the system board.</li> </ol>
Power LED flashes Red six times, once every second, followed by a two second pause, and the workstation beeps six times.	Video card is not seated properly or is bad, or system board is bad.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none"> <li>1. Reseat the graphics card. Power on the system.</li> <li>2. Replace the graphics card.</li> <li>3. Replace the system board.</li> </ol> <p>For systems with integrated graphics, replace the system board.</p>

# Solving Network Problems

These guidelines do not discuss the process of debugging the network cabling.

## Solving Network Problems

Problem	Cause	Solution
Wake-on-LAN feature is not functioning.	Wake-on-LAN is not enabled.	Use the Network control application to enable Wake-on-LAN.
Network driver does not detect network controller.	Network controller is disabled.	Run Computer Setup and enable network controller.
	Incorrect network driver.	Check the network controller documentation for the correct driver or obtain the latest driver from the manufacturer's Web site.
<p>Network status link light does not turn on or it never flashes.</p> <p> The network status light should flash when there is network activity.</p>	No active network is detected.	Check cabling and network equipment for proper connection.
	Network controller is not set up properly.	Use the Network control application to verify that the device is working properly.
	Network driver is not properly loaded.	Reinstall network drivers.
	System cannot autosense the network.	Disable auto-sensing capabilities and force the system into the correct operating mode.
Diagnostics reports a failure.	The cable is not securely connected.	Ensure that both ends of the data cable are securely connected.
	The cable is attached to the incorrect connector.	Ensure that the cable is attached to the correct connector.
	There is a problem with the cable or a device at the other end of the cable.	Ensure that the cable and device at the other end are operating correctly.
	Network controller interrupt is shared with an expansion board.	Under the Computer Setup <b>Advanced</b> menu, change the resource settings for the board.
	The network controller is defective.	Replace the NIC.
Diagnostics passes, but the workstation does not communicate with the network.	Network drivers are not loaded, or driver parameters do not match current configuration.	<ol style="list-style-type: none"> <li>1. Make sure the network drivers are loaded and that the driver parameters match the configuration of the network controller.</li> <li>2. Make sure the correct network client and protocol is installed.</li> </ol>

## Solving Network Problems (Continued)

Problem	Cause	Solution
Diagnostics passes, but the workstation does not communicate with the network. (continued)	The network controller is not configured for this workstation.	Select the <b>Network</b> icon in the <b>Control Panel</b> and configure the network controller.
Network controller stopped working when an expansion board was added to the workstation.	Network controller interrupt is shared with an expansion board.	Under the Computer Setup <b>Advanced</b> menu, change the resource settings for the board.
	The network controller requires drivers.	Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed.
	The expansion board installed is a network card (NIC) and conflicts with the embedded NIC.	Under the Computer Setup <b>Advanced</b> menu, change the resource settings for the board.
Network controller stops working without apparent cause.	The files containing the network drivers are corrupted.	Reinstall the network drivers, using the <i>Restore Plus!</i> CD.
	The cable is not securely connected.	Ensure that both ends of the cable are securely attached to the correct devices.
	The network controller is defective.	Replace the NIC.
New network card will not boot.	New network card may be defective or may not meet industry-standard specifications.	Install a working, industry-standard NIC, or change the boot sequence to boot from another source.
Cannot connect to network server when attempting Remote System Installation.	The network controller is not configured properly.	Verify Network Connectivity, that a DHCP Server is present, and that the Remote System Installation Server contains the NIC drivers for your NIC.
System setup utility reports unprogrammed EEPROM.	Unprogrammed EEPROM.	Flash the ROM.

# Solving Memory Problems



**CAUTION:** For those systems that support ECC memory, HP does not support mixing ECC and non-ECC memory. Otherwise, the system will not boot the operating system.

## Solving Memory Problems

Problem	Cause	Solution
System will not boot or does not function properly after installing additional memory modules.	Memory module is not the correct type or speed or the new memory module is not seated properly.	Replace module with the correct industry-standard device for the workstation.  On some models, ECC and non-ECC memory modules cannot be mixed.
Out of memory error.	Memory configuration may not be set up correctly.	Use the Device Manager to check memory configuration.
	You have run out of memory to run the application.	Check the application documentation to determine the memory requirements.
Memory count during POST is wrong.	The memory modules may not be installed correctly.	Check that the memory modules have been installed correctly and that proper modules are used.
Insufficient memory error during operation.	Too many Terminate and Stay Resident programs (TSRs) are installed.	Delete any TSRs that you do not need.
	You have run out of memory for the application.	Check the memory requirements for the application or add more memory to the workstation.
Power LED flashes Red five times, once every second, followed by a two second pause, and the workstation beeps five times.	Memory is installed incorrectly or is bad.	<ol style="list-style-type: none"> <li>1. Reseat DIMMs.</li> <li>2. Replace DIMMs one at a time to isolate the faulty module.</li> <li>3. Replace third-party memory with HP memory.</li> <li>4. Replace the system board.</li> </ol>

# Solving Processor Problems

## Solving Processor Problems

Problem	Cause	Solution
Poor performance is experienced.	Processor is hot.	<ol style="list-style-type: none"> <li>1. Make sure the airflow to the workstation is not blocked.</li> <li>2. Make sure the fans are connected and working properly (some fans only operate when needed).</li> <li>3. Make sure the processor heatsink is installed properly.</li> </ol>
Power LED is Red and stays on.	Processor is not seated properly or not installed.	<ol style="list-style-type: none"> <li>1. Check to see that the processor is present.</li> <li>2. Reseat the processor.</li> </ol>

# Solving CD-ROM and DVD Problems

## Solving CD-ROM and DVD Problems

Problem	Cause	Solution
System will not boot from CD-ROM or DVD drive.	The CD-ROM or DVD boot is not enabled through the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media and verify boot order settings.
	Non-bootable CD in drive.	Try a bootable CD in the drive.
CD-ROM or DVD devices are not detected or driver is not loaded.	Drive is not connected properly or not properly configured.	<ol style="list-style-type: none"> <li>1. Reconnect power and data cables to the drive.</li> <li>2. Install correct device driver.</li> </ol>
Movie will not play in the DVD drive.	Movie may be regionalized for a different country.	See the documentation that came with the DVD drive.
	Decoder software is not installed.	Install decoder software.
Cannot eject compact disc (tray-load unit).	Disc not properly seated in the drive.	<ol style="list-style-type: none"> <li>1. Turn off the workstation and insert a thin metal rod into the emergency eject hole and push firmly.</li> <li>2. Slowly pull the tray out from the drive until the tray is fully extended, then remove the disc.</li> </ol>
CD-ROM, CD-RW, DVD-ROM, or DVD-R/RW drive cannot read a disc or takes too long to start.	CD has been inserted upside down.	Re-insert the CD with the label facing up.
	The DVD-ROM drive takes longer to start because it has to determine the type of media played, such as audio or video.	Wait at least 30 seconds to let the DVD-ROM drive determine the type of media being played. If the disc still does not start, read the other solutions listed for this topic.
	CD or DVD disc is dirty.	Clean CD or DVD with a CD cleaning kit.
	Windows does not detect the CD-ROM or DVD-ROM drive.	<ol style="list-style-type: none"> <li>1. Use Device Manager to remove or uninstall the device in question.</li> <li>2. Restart the workstation and let Windows detect the device.</li> </ol>



### Solving CD-ROM and DVD Problems *(Continued)*

Problem	Cause	Solution
Recording audio CDs is difficult or impossible.	Wrong or poor quality media type.	<ol style="list-style-type: none"> <li>1. Try using a slower recording speed.</li> <li>2. Verify that you are using the correct media for the drive.</li> <li>3. Try a different brand of media. Quality varies widely between manufacturers.</li> </ol>

## Solving Drive Key Problems

### Solving Drive Key Problems

Problem	Cause	Solution
Drive key is not seen as a drive letter in Windows XP.	The drive letter after the last physical drive is not available.	Change the default drive letter for the Drive key in Windows XP.
The workstation boots to DOS after making a bootable Drive key.	Drive key is bootable.	Install the Drive key after the operating system boots.

## Solving Internet Access Problems

### Solving Internet Access Problems

Problem	Cause	Solution
Unable to connect to the Internet.	Internet Service Provider (ISP) account is not set up properly.	Verify Internet settings or contact the ISP for assistance.
	Modem is not set up properly.	Reconnect the modem. Verify the connections are correct using the quick setup documentation.
	Web browser is not set up properly.	Verify that the Web browser is installed and set up to work with your ISP.
	Cable/ DSL modem is not plugged in.	Plug in cable/DSL modem. You should see a "power" LED light on the front of the cable/DSL modem.

## Solving Internet Access Problems (Continued)

Problem	Cause	Solution
Unable to connect to the Internet. (continued)	Cable/DSL service is not available or has been interrupted due to bad weather.	Try connecting to the Internet at a later time or contact your ISP. (If the cable/DSL service is connected, the "cable" LED light on the front of the cable/DSL modem will be on.)
	The CAT5 10/100 cable is disconnected.	Connect the CAT5 10/100 cable between the cable modem and the workstation's RJ-45 connector. (If the connection is good, the "PC" LED light on the front of the cable/DSL modem will be on.)
	IP address is not configured properly.	Contact the ISP for the correct IP address.
	Cookies are corrupted.	<p><i>Windows 2000</i></p> <ol style="list-style-type: none"> <li>1. Select <b>Start &gt; Settings &gt; Control Panel</b>.</li> <li>2. Double-click <b>Internet Options</b>.</li> <li>3. On the <b>General</b> tab, click the <b>Delete Cookies</b> button.</li> </ol> <p><i>Windows XP</i></p> <ol style="list-style-type: none"> <li>1. Select <b>Start &gt; Control Panel</b>.</li> <li>2. Double-click <b>Internet Options</b>.</li> <li>3. On the <b>General</b> tab, click the <b>Delete Cookies</b> button.</li> </ol>
Cannot automatically launch Internet programs.	You must log on to the ISP before some programs will start.	Log on to the ISP and launch the desired program.

## Solving Internet Access Problems *(Continued)*

Problem	Cause	Solution
Internet takes too long to download Web sites.	Modem is not set up properly.	<p>Verify that the correct modem speed and COM port are selected.</p> <p><i>For Windows 2000</i></p> <ol style="list-style-type: none"> <li>1. Select <b>Start &gt; Settings &gt; Control Panel</b>.</li> </ol> <p>Continue with step #2</p> <p><i>For Windows XP</i></p> <ol style="list-style-type: none"> <li>1. Select <b>Start &gt; Control Panel</b>.</li> </ol> <p>Continue with step #2</p> <ol style="list-style-type: none"> <li>2. Double-click <b>System</b>.</li> <li>3. Click the <b>Hardware</b> tab.</li> <li>4. In the Device Manager area, click the <b>Device Manager</b> button.</li> <li>5. Double-click <b>Ports (COM &amp; LPT)</b>.</li> <li>6. Right-click the COM port your modem uses, then click <b>Properties</b>.</li> <li>7. Under <b>Device status</b>, verify that the modem is working properly.</li> <li>8. Under <b>Device usage</b>, verify the modem is enabled.</li> <li>9. If there are further problems, click the <b>Troubleshoot</b> button and follow the on-screen instructions.</li> </ol>



## System Board and Riser Board Reference Designators

These reference designators are used on most but not all hp system and riser boards.

Designator	Component
BT1	Battery socket/Battery
CR1	LED - 3.3V Aux
CR2	LED - Power button press
CR3	LED - PS_ON (off), 5.5V Aux (on)
CR11	CPU reset LED
CR34	Power ON LED
CR35	Hard drive activity LED
E14	Boot block header/jumper
E49	Clear Password header/jumper
E50	Clear CMOS header
H5	RTC clock crystal/Tie-down
J6	BNC
J7	RJ-45 Jack
J9	Stacked RJ45/Dual USB connector
J10	ISA slot
J11	IEEE 1394
J12	IEEE 1394
J13 - 19	ISA slots
J20 - 29	PCI slots
J30	Riser board socket
J31 - J35	Device Bay connectors
J36	AC97 connector
J37	Primary SCSI connector
J38	Secondary SCSI connector
J39	Stacked parallel/SCSI connector
J40	AGP slot
J50	First parallel port
J51	Second parallel port
J52	Double-stacked parallel port
	Top Port B
	Bottom Port A

<b>Designator</b>	<b>Component</b> <i>(Continued)</i>
J53	Parallel port over single Serial Port
J54	Parallel port over Serial Port and Video Port
J55	Parallel port over dual VGA ports
J65	DVI connector
J66	Keyboard connector (Closest to power supply)
J67	Mouse connector
J68	Double-stacked mouse/keyboard connector Top Mouse Bottom Keyboard
J69	Video connector
J70	Primary single USB connector
J71	Secondary single USB jack
J72	Microphone jack
J73	Line-in jack
J74	Line-out jack
J75	Headphone jack
J76	Volume control
J77	Double-stacked headphone/microphone connector Top Microphone Bottom Headphone
J78	Double-stacked line-in/line-out connector Top Line in Bottom Line out
J80	Stacked serial/audio connector
J81	Primary double-stack USB Top Port 2 Bottom Port 1
J82	Secondary double-stack USB Top Port 4 Bottom Port 3
J83	Triple-stacked audio jack (line in, line out/headphone, microphone)
J101	Security board connector for security card
J113	Video cache connector
JP49	Clear password header/jumper
L1	USB front port choke
L2	USB rear port choke (1st)
L3	USB rear port choke (2nd)
L4	USB rear port choke (3rd)
P1	P/S connector
P3	VCCP 12V header
P4	Secondary processor 12V header
P5	Main Power/HDD LED connector
P6	Speaker connector

<b>Designator</b>	<b>Component (Continued)</b>
P7	Audio connector (from CD-ROM)
P8	Primary chassis fan connector
P9	Secondary chassis fan header
P10	Diskette drive connector
P11	Second Audio connector
P12	Alert on LAN NIC connector
P13	VRM module connector
P15	AUI connector
P16	Fan command/fan sink header
P20	Primary IDE connector
P21	Secondary IDE connector
P22	Slimline CD-ROM connector
P23	Header for front audio panel
P24	Header for front panel USB
P25 - P26	Video memory upgrade connector
P27	MultiBay header (available on select HP systems only)
P29	SCSI LED connector
P30	Primary serial ATA (SATA) port
P31	Secondary serial ATA (SATA) port
P50	Serial debug header
P52	Serial port header
P53	First serial port
P54	Second serial port
P55	Double stack serial port Top            Serial B Bottom        Serial A
P58	Riser edge connector (male-mates with J30)
P64	VSFF expansion connector
P65	Graphics option connector
P70	Primary (CPU) fan header for fansink
P71	Secondary CPU fan header for fansink
P89	Floating serial port /COM port header
P100	ITP connector
P101	Security card connector, system board
P120	Secondary chassis fan header
P124	Hood lock header
P125	Hood sensor header
P216	White box chassis fan
SW1	Processor speed switch
SW2	Security hood switch
SW50	Clear CMOS switch/push button

<b>Designator</b>	<b>Component</b> <i>(Continued)</i>
SW51	Power button switch
SW52	System reset switch
U7	64-bit bridge chip for Workstation group
U15	ROM chip
U100	Security chip
XBT1	Battery socket
XMM1	Memory slot. DIMM1 or RIMM1 populated and tested
XMM2 - XMM5	Following memory slots
XU1	Primary processor socket Secondary processor socket
XU2	ROM socket
XU15	ROM socket
XU100	Security chip socket
Y1	Primary (TH) system clock crystal
Y2	Secondary (SMT) system clock crystal
Y3	Primary (YTH) NIC clock crystal
Y4	Secondary (SMT) NIC clock crystal
Y5	RTC clock crystal/tie-down



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## Memory

Your workstation has double data rate synchronous dynamic random access memory (DDR-SDRAM) dual inline memory modules (DIMMs).

The memory sockets on the system board can be populated with up to four industry-standard DIMMs. These memory module slots are populated with at least one preinstalled memory module. To achieve the maximum memory support, you can populate the system board with up to 4GB of memory configured in a high-performing dual channel mode.

For proper system operation, if the workstation supports DDR-SDRAM DIMMs, the DIMMs must be industry-standard 184-pin, PC2700 333 MHz-, or PC3200 400 MHz-compliant, 2.5 volt DDR-SDRAM DIMMs. The DDR-SDRAM DIMMs must also:

- support CAS latency 2, 2.5, or 3 (CL = 2, CL = 2.5, CL=3)
- contain the mandatory JEDEC SPD information

In addition, the workstation supports:

- 128Mbit, 256Mbit, and 512Mbit non-ECC memory technologies
- single-sided and double-sided DIMMS
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported

The following processor bus frequencies are required for the system to run at the supported memory frequencies.

Memory Frequency	Required Processor Bus Frequency
333 MHz	533 MHz or 800 MHz
400 MHz	800 MHz

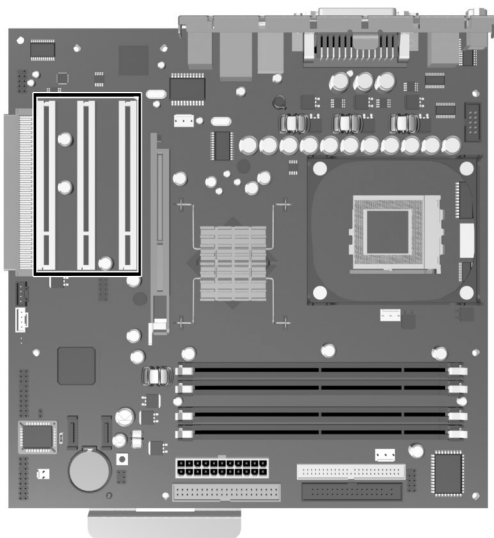
If a memory frequency is paired with an unsupported processor bus frequency, the system will run at the highest supported memory speed. For example, if a 333 MHz DIMM is paired with a 400 MHz processor bus, the system will run at the lower supported memory speed.



The system will not start if you install unsupported DIMMs.

## DIMM Sockets

There are four DIMM sockets on the system board, with two sockets per channel. The sockets are labeled XMM1, XMM2, XMM3, and XMM4. Sockets XMM1 and XMM2 operate in memory channel A. Sockets XMM3 and XMM4 operate in memory channel B.



Item	Description	Socket Color
❶	DIMM socket XMM1, Channel A	Black
❷	DIMM socket XMM2, Channel A	Blue
❸	DIMM socket XMM3, Channel B	Black
❹	DIMM socket XMM4, Channel B	Blue

The system will automatically operate in single channel mode or a higher-performing dual channel mode, depending on how the DIMMs are installed.

- In single channel mode, the maximum operational speed is determined by the slowest DIMM in the system. For example, if the system is populated with a DIMM that is 333 MHz and a second DIMM that is 400 MHz, the system will run at the slower of the two speeds.
- In dual channel mode, the DIMM pairs must be identically matched. DIMMs in the XMM1 and XMM3 black sockets must be identical; DIMMs in the XMM2 and XMM4 blue sockets must also be identical. Therefore, if you have one preinstalled DIMM in socket XMM1 and are adding a second DIMM, it is recommended that you install an identical DIMM into the XMM3 socket.
- In dual channel mode, the DIMM pairs must be identically matched. DIMMs in the XMM1 and XMM3 black sockets must be identical; DIMMs in the XMM2 and XMM4 blue sockets must also be identical. Therefore, if you have one preinstalled DIMM in socket XMM1 and are adding a second DIMM, it is recommended that you install an identical DIMM into the XMM3 socket. If you are populating all four DIMM sockets, use identical DIMMs in each socket. Otherwise, the system will not operate in dual channel mode.

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# Ultra ATA Drive Guidelines and Features

## Ultra ATA Jumpers

Ultra ATA drives are configured by means of jumper settings. Factory-installed drives ship with the jumpers preset to the cable-select mode; therefore, no jumper setting changes are required on factory pre installed, replacement, or option drives. With cable-select, the drive is configured as either Master (Drive/Device 0) or Slave (Drive/Device 1) by its physical attachment to the cable.

If you purchase a third-party hard drive, refer to the documentation included with the drive kit to ensure proper cable installation and configuration.



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All drives on a controller channel need to have their jumpers either in the cable-select mode or have the individual drive jumper installed on the appropriate Master (Drive/Device 0) or Slave (Drive/Device 1) position.

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## Ultra ATA Cables

When installing a second device on either the primary or secondary controller, you must use an industry standard 80-conductor Ultra ATA cable for optimal performance. These cables have a maximum length of 18 inches and a maximum distance of 6 inches between the two devices for a two-drive cable.

Drives operating at speeds faster than those of the Ultra ATA-33 devices require industry-standard 40-pin, 80-conductor cables to maintain the higher data transfer rates possible with the improved technology.

When using Ultra ATA-133, -100, -66, and slower -33 drives in the same system, each drive will operate at its appropriate data transfer rate.

## Cable Layout

The faces of industry-standard cable connectors are color coded for easy recognition:

- System board connector = blue face
- Device 0 connector = black face
- Device 1 connector = gray face

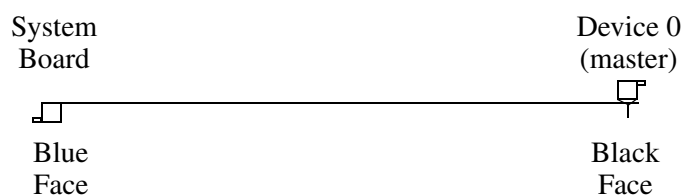


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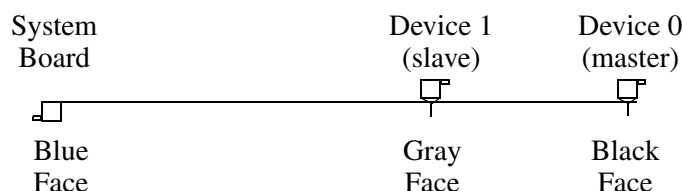
The color code of an industry-standard cable is valid only if the drive's jumper is in the cable-select position.

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## Single-Drive Cable



## Two-Drive Cable



On a two-drive cable, the Drive/Device 0 connector is always the farthest one from the system board connector and the Drive/Device 1 connector is always the closest to the system board connector.



Some cables may be labeled “Drive 0” instead of “Device 0” and “Drive 1” instead of “Device 1”.

## Drive Installation Guidelines

Your workstation supports three drive bays and contains two ATA (IDE) controller channels with a dedicated connector on the system board for each controller. One controller is designated as the primary and the other as the secondary. Each controller can have up to two devices attached to it via an industry-standard 80-conductor cable.



To install a secondary hard drive, you must use a dual-headed cable (PN 108950-051).

Any drive attached to a ATA controller must have a drive designation, such as Device 0 (Master Drive) or Device 1 (Slave Drive). Drives set to the cable select mode will automatically be designated as Device 0 or Device 1 depending on where they are connected on the device cable and whether or not they are the only drive connected to the cable. For optimal performance of your system, all drives need to be attached to the primary and secondary ATA controllers in a specified sequence. This sequence is determined by the device class and by specific attach sequence rules.

## Device Classes

In order to determine the best drive attach sequence, ATA/ATAPI drives are segregated into four different classes based upon the bandwidth demands they place on an ATA controller. The most demanding devices are in Class 1 and the least demanding are in Class 4.

<b>Class 1 Hard Drives</b>	<b>Class 2 High Speed Optical Drives</b>	<b>Class 3 Optical Storage Drives</b>	<b>Class 4 Magnetic Storage Drives</b>
ATA-100 ATA-66 ATA-33	DVD DVD-CD R/W	R/W CD-ROM CD-ROM	LS-120 Tape Zip Diskette



The above classifications are used as examples only. Your system may or may not support some Class 4 drives. A diskette drive is Class 4, however, this drive has an exclusive connector on the system board and is not considered when “counting” the number of devices allowed on a given ATA controller. For a hardware compatibility list for your specific system, please refer to [www.hp.com/support](http://www.hp.com/support).

## General Attach Guidelines

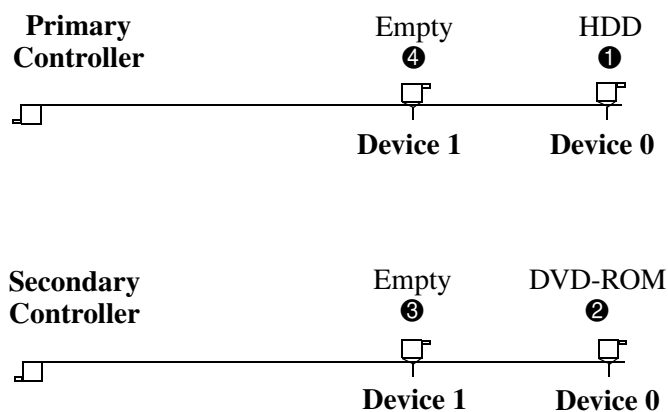
- The lower the device class number, the faster the device and the more bandwidth required.
- Drives installed in the Device 0 positions on both the primary and secondary controllers receive the greatest possible bandwidth.
- The bootable ATA hard drive should always be installed on the primary controller in the Device 0 position.

## Device Attach Sequences

**Scenario One:** a system has two devices. Using the Device Class Table above, the device class for each is identified as:

- Ultra ATA-100 hard drive = Class 1
- DVD-ROM drive = Class 2

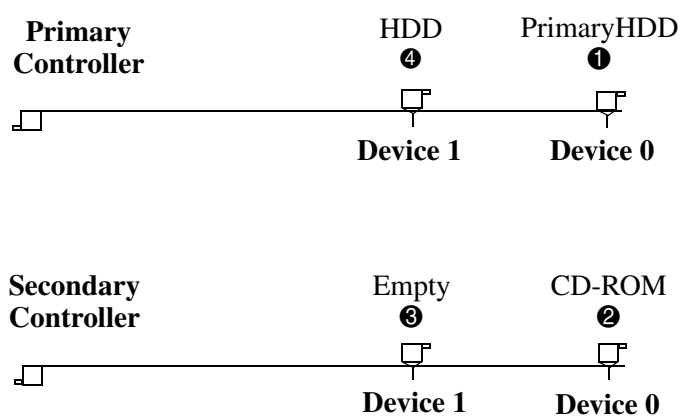
<b>Attach Sequence - Two Device</b>				
<b>Device Name</b>	<b>Device Class</b>	<b>Position Number</b>	<b>ATA Controller</b>	<b>Device Number</b>
Ultra ATA-100 hard drive	1	❶	Primary	0
DVD-ROM drive	2	❷	Secondary	0



**Scenario Two:** a system has three devices. Using the Device Class Table in Section 4.3.1, the device class for each is identified as:

- Ultra ATA-100 hard drive = Class 1
- Ultra ATA-100 hard drive = Class 1
- CD-ROM drive = Class 3

Attach Sequence - Three Device				
Device Name	Device Class	Position Number	Controller Name	Device Number
Ultra ATA-100 hard drive	1	①	Primary	0
Ultra ATA-100 hard drive	1	④	Primary	1
CD-ROM drive	3	②	Secondary	0



## Additional Drive Application Notes

- When replacing a hard drive, the replacement should be of the same type (Ultra ATA -33, -66, or -100) as that being removed to retain the same level of performance.
- Your system supports a maximum of three drives. A second hard drive can be install in your system; however, you **MUST** remove the diskette drive to create an available drive bay.
- Some graphics cards (such as the nVIDIA Quadro4 400 NVS) will require the removal of the diskette drive (or hard drive, if installed) in bay 1. See Chapter 5 for Drive Positions.

## SMART Drives

The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for HP workstations have built-in drive failure prediction that warns the user or network administrator of an impending failure or crash of the hard drive. The SMART drive tracks fault prediction and failure indication parameters such as reallocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

## Drive Capacities

The combination of the file system and the operating system used in the workstation determines the maximum usable size of a drive partition. A drive partition is the largest segment of a drive that may be properly accessed by the operating system. A single hard drive may therefore be subdivided into a number of unique drive partitions in order to make use of all of its space.

The table that follows identifies the capabilities and restrictions imposed on the workstation by the combinations of BIOS, file and operating systems.

<b>Microsoft to Drive Manufacturer Size Conversion Table*</b>	
<b>Drive Size as Identified by Microsoft Operating System</b>	<b>Drive Size as Identified by Drive Manufacturers</b>
40 GB	42.9 GB
80 GB	85.9 GB
160 GB	171.7 GB
*Drive size calculations by drive manufacturers are bytes to the base 10 while calculations by Microsoft are bytes to the base 2.	

<b>Drive/Partition Capacity Limits</b>					
<b>File System</b>	<b>Controller Type</b>	<b>Operating System</b>	<b>Drive Size</b>	<b>Max Partition Size</b>	<b>Max # of Partitions</b>
FAT 32	ATA	Windows 2000/ XP	128 GB	32 GB	4
NTFS	ATA	Windows 2000/XP	128 GB	128 GB	1





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